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PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

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Municipal Engineering

VOLUME XIV. MARCH, EIGHTEEN NINETY-EIGHT. NUMBER 3.

DIMENSIONS OF SEWER PIPE.

By A. D. Thompson, City Engineer, Peoria, Ill.

The November number of MUNICIPAL ENGINEERING contained an inquiry regarding the standard dimensions of sewer pipe which the correspondent supposed had been adopted by the American Society of Civil Engineers.

The Illinois Society of Engineers and Surveyors is the only engineering society known to the writer that has ever attempted to establish definite and proper dimensions for sewer pipes. At the annual meeting of this society in January, 1895, a special committee, of which the writer was chairman, was appointed upon Standard Specifications and Tests for Paving Brick and Sewer Pipe. This committee consulted with engineers, contractors and manufacturers, regarding the specifications in force throughout the United States, and the modifications of same considered advisable. After thoroughly considering the requirements and suggested changes, the following report regarding standard dimensions for sewer pipes was submitted, and adopted by the society:

That all pipe be salt glazed, vitrified earthenware, of the hub and spigot pattern, and of the following dimensions:

Diameter of Pipe. Inches.	Length. Feet.	Depth of Socket.	Annular Space. Inches.	Thickn'ss of Shell. Inches.
3	2	1½	¼	⅝
4	2	1½	¼	⅝
6	2	2	¼	¾
8	2½	2½	⅜	¾
10	2½	2½	⅜	⅞
12	2½	2½	½	1
15	2½	3	½	1¼
18	2½	3	½	1½
20	2	3	½	1¾
24	2	3½	⅝	2
30	2	4	⅝	2½

The pipe to be circular in form, with no variation allowed from a true circle.

The committee believe that it is fairer to the manufacturer, and will insure better results, to require a given crushing strength rather than to stipulate a certain thickness of shell for each size of pipe, regardless of the material from which it is manufactured, which is the practice at present. This strength requirement should be calculated so as to support with safety the weight of the earth coming upon the pipes. The support of the earth by friction along the sides of the trench is a large factor entering into the calculation, which we have had neither time nor facilities for determining, and for this reason would recommend that the thicknesses given above be adopted as standard until the proper investigations can be made for determining the strengths necessary for pipes laid at various depths.

The length of the pipe, depth of socket and the necessary annular space are requirements that may

control the quality of the work and are matters of personal judgment; but the thickness of the shell determines the safety of the sewer, and must be based upon the inexorable laws of nature. This requirement, then, is the only one that demands searching attention.

As noted in the report of the committee the support of the earth over the pipe by friction along the sides of the trench is an indeterminate factor which should not enter into the calculations. This force varies with the different soils, the extremes being a soil of pure sand and one of stiff clay. In the first case when the sheeting is pulled the boundaries of the trench disappear and the pipe must bear the weight of all the soil above it, since the material is not in the least self-supporting. If the refilling in a clay soil be made without water, the friction along the sides of the trench is a maximum, and together with the lumpy formation of the material supports a large portion of the weight. The first heavy rain causes the friction to disappear, and the pipe must bear the entire weight of the water-soaked soil above it. The frictional force, therefore, is of no moment since the pipe must in the end bear the full weight of the water-soaked earth above it, regardless of the material in the trench or the method of refilling.

The thickness of the pipes required by different cities varies considerably, but a considerable experience in such work has satisfied the writer that pipes from ten to twenty-four inches in diameter, as ordinarily manufactured, are not sufficiently strong to support the weight of the earth above them, when laid at depths exceeding 15 to 18 feet. This experience conforms to the results of the few experiments which have been made to determine the crushing strength of sewer pipes.

Professor Malverd A. Howe of Rose Polytechnic Institute, several years ago conducted an extensive series of tests upon sewer pipes to determine their strength. Samples from fifteen factories were given the hydrostatic, drop, concentrated load, uniform load and cement joint tests. The method of conducting these tests and the results are given in a paper read by Professor Howe before the Engineer's Club of St. Louis in 1891.

Under ordinary conditions a sewer pipe bears a uniform load, and this test is really the only one that approaches the practical conditions. In Professor Howe's tests a ten-inch pipe bedded in sand and uniformly loaded, cracked longitudinally when loaded with from 2,500 to 7,500 pounds. The average of six tests showed that the pipe cracked at 4,600 pounds when uniformly loaded. Since a crack destroys the utility of a pipe for sewer purposes, this strength may be taken as its ultimate available strength.

A ten-inch pipe supports a column of earth one foot in width. This will weigh, when wet, from 118 to 129 pounds per cubic foot, if it be sand, or from 110 to 120 pounds per cubic foot, if it be earth, according to Trautwine. A pipe two feet long must support a weight of 2×124, or 248 pounds in sand, or $2 \times 115 = 230$ pounds in clay, for every foot of depth.

$4600 \div 248 = 18.5$ = depth in feet at which the average pipe, 10 inches in diameter, cracks in sand.

$4600 \div 230 = 20$ = depth in feet at which the average pipe, 10 inches in diameter, cracks in clay or earth.

Again, $2500 \div 248 = 10$ and 2500

STONY BROOK CONDUIT, BOSTON, SHOWING ROCK EXCAVATION.

÷230=11, which represent the depths at which a ten-inch pipe may crack, or they may be buried three times those depths before the failing point is reached.

THE FILTRATION OF SEWAGE.

By Albert S. Crane, C. E., Dept. of City Works, Brooklyn, N. Y.

The nearly prevalent idea that the purification of sewage by filtration is a method adapted only to small towns and cities, particularly favored by nature, seems doomed to fall. When it was thought that not more than 100,000 gallons of sewage per day, at the most, could be treated by an acre of filter, it was not strange that filtration was not thought highly of as a practical method of disposal.

The insufficiency of the results given by the chemical processes led to continued experiments, until we now have methods before us which will treat over one million gallons per acre per day, without the use of chemicals or the formation of sludge.

Instead of using sand or fine gravel as the filtering material, very coarse particles are used. The large spaces or voids between them allow the suspended matter of the sewage to enter into the body of the filter instead of being held to clog the surface.

Cinders, coke breeze, burnt clay or any rough material will answer the purpose, one desirable quality being that the particles should have as much surface as possible. In England these beds have been called "bacteria tanks" or "digestors," for the sewage seems rather to be digested than filtered.

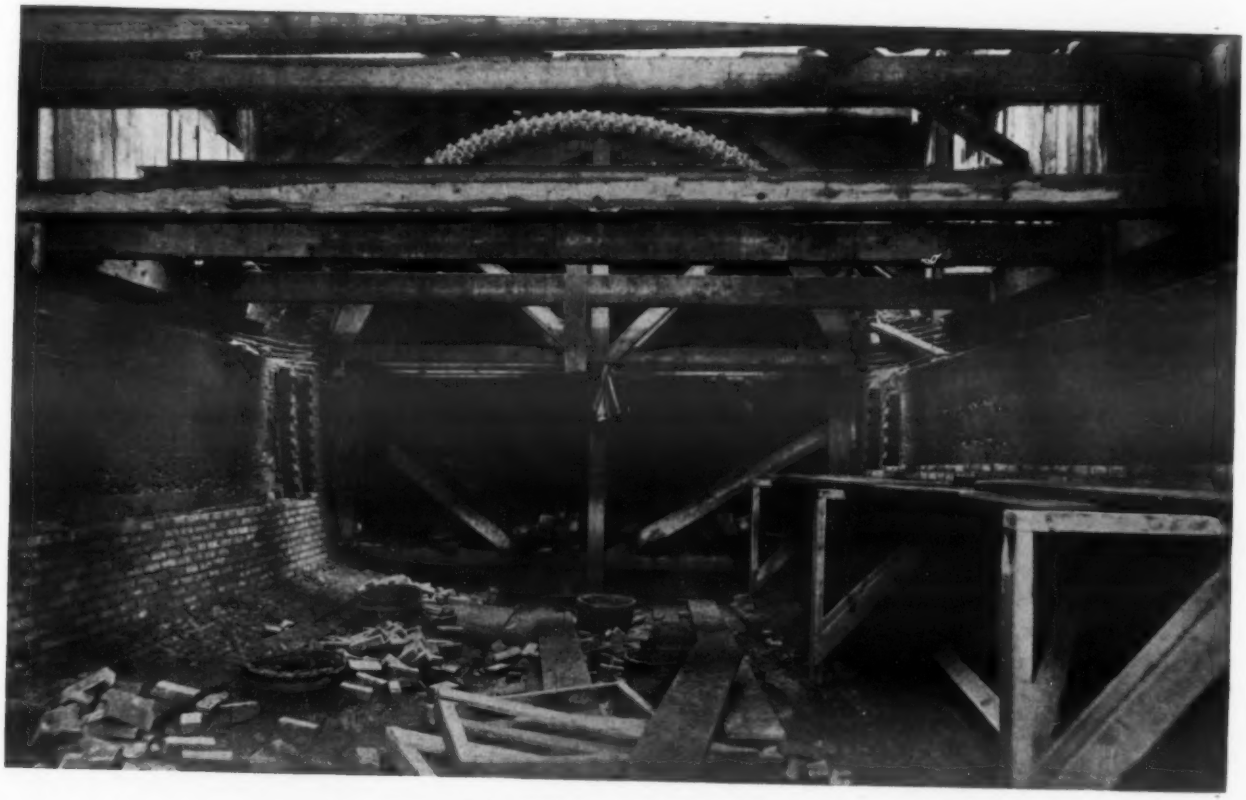
The most widely known of the works of this type are those at Sutton. They were built by Messrs. Greatorex and Smith, following out the suggestions of W. J. Dibdin, late chemist to the London County Council.

They consist of three primary tanks of 1650 sq. ft. each, filled with 5 feet of burnt clay ballast which had been rejected by a ½-in. mesh screen. On the bottom is a 6-in. drain fitted with a 6-in. valve, and 19 branch drains of 3-in. pipe. The effluent from these three tanks and from several chemical precipitation tanks is treated by eight secondary tanks. The secondary tanks have each an area of 6160 sq. ft. and are 2 ft. 9 in. in depth. The filtering material consists of 29 in. of burnt clay ballast which had passed through a ½-in. mesh screen and been freed from dust, and 4 in. of coke breeze which was placed on top.

Since November 24, 1896, one of the primary tanks has been treating crude sewage at the rate of 1,089,000 U. S. gallons per acre per day, and the secondary tanks have been treating the effluent at the rate of 842,160 gallons per acre per day.

After being operated over a year they show no signs of becoming clogged, and are apparently in as good condition as when first used. With proper care their life seems indefinite.

In their method of operation they also differ radically from the older forms of sewage filters. The valve on the under drain is closed and the bed allowed to fill with crude



STONY BROOK CONDUIT, BOSTON.

sewage, after which the sewage is turned into another bed. The sewage in the first bed is allowed to remain there for two hours, when the valve is opened and the effluent runs to one of the secondary filters where it receives a similar treatment. The cycle of operations is about as follows: ¾ of an hour for filling, 2 hours standing full, 1¼ hours for emptying, and 2 hours for standing empty and taking in air.

The average results of the analyses at the different stages is as follows, the results being given in grains per gallon (English):

Crude Sewage.		Effluent from Primary Tank.	Effluent from Secondary Tank.
Chlorine	8.99	6.94	6.84
Oxygen absorbed in 4 hours	4.543	1.674	0.644
Nitrogen as nitrites	0.0150	0.165	0.047
" " nitrates	none	0.411	1.068
Free ammonia	8.774	2.103	0.671
Albuminoid ammonia	0.792	0.329	0.170
Suspended matter	60.03	2.78	0.745

From this table it will be seen that the reduction of the oxidizable matters in solution was 63 per cent. for the primary tank and 86 per cent. for both. The reduction of the nitrogenous organic matter, as shown by the albuminoid ammonia, was 58 per cent. for the primary tank and 78 per cent. for the combination.

Mr. R. E. Wynne-Roberts, borough engineer of Oswestry, Wales, has designed for that city a system of filters in which both the primary, and secondary filters are divided into nine parts, eight parts being in use while the other is resting. The secondary filters are placed on a lower level than the primary, so that the effluent from the latter can run by gravity to the former. The turning on and shifting of the sewage from one bed to another is done automatically.

The writer is indebted for much of the information in this article to Mr. Roberts and to Mr. C. Chambers Smith, borough surveyor of Sutton.

PROGRESS IN THE MANUFACTURE OF AMERICAN PORTLAND CEMENT.

By John W. Dickinson, Mem. Western Soc. Engineers.

I had the satisfaction, and I shall always regard it as an honor, of being associated with the company manufacturing the first barrel of Portland cement in this country. The year was 1872, the location Kalamazoo, Mich., and most properly the name of the company, also the brand, was in honor of our national symbol, the American eagle. And the eagle did scream, but, unfortunately, as the selling price was about four dollars per barrel, and our cost of manufacture anywhere from five to six dollars per barrel, our screams soon drowned those of the noble bird, and the poor frightened thing—that no foreign foe has ever been able to humiliate—was laid low by its supposed friends, and in its own home. We did, however, make a good cement, and to-day, after twenty-five years, many sidewalks and improvements stand as monuments to the reliability of the old Eagle Portland cement.

Other mills started up in different parts of the country with more or less success, according to the

KEAR STREET OUTLET, BOSTON.

quality of cement produced, so that to-day we have in the United States, about thirty Portland cement mills —eight in Pennsylvania, two in New Jersey, five in New York, five in Ohio, two in Michigan, one in Indiana, one in Illinois, one in South Dakota, one in Arkansas, one in Texas, one in Utah, and two on the Pacific Coast. These vary in size from an output of less than fifty barrels, up to two thousand barrels per day, and the variation in quality is only less than the variation in size. But, unfortunately for the welfare of the industry, the size of the mill is not in every case in proportion to the quality produced. We make in this country Portland cement of the highest grade—cement for precision of manufacture and reliability that is unequalled. We, like England, Germany, France, Belgium, Sweden, Norway, Russia, Denmark and other Portland cement producing countries, make poor cements, and we, no doubt, as well as they, will continue to have cement mills that will not, or can not, produce a first-class article.

There has always been a difference of fifty to sixty cents per barrel in cost and in value between the lower and higher grades of imported cement, and there will always be a corresponding difference in cost and in value of American cements, and my experience is that the very best cement obtainable is *always* the cheapest.

I do not in the least underestimate the necessity of good workmanship, and I know that inexperience and dishonest methods are the cause of much poor work; but I also know that in many, many cases the failure of concrete and cement floors and sidewalks is directly chargeable to the inferior cement used. Engineers, architects and owners are not sufficiently careful in selecting cements; and in many cases, after specifying a high grade cement, allow a cheaper and inferior article to be substituted by the irresponsible contractor.

While in Germany a few years ago, I was strongly solicited to purchase a certain cement. I visited the plant, which was then only in course of erection, and found that the company hoped to be turning out cement in the course of a month or so. The only practical (?) man connected with the plant had been lately discharged from one of the old companies for incompetency. He had interested certain capitalists in his new scheme, but had only one dollar where the undertaking should have had three. Of course I declined to attempt to force the product of such an enterprise on the American market. This was in December; the following June this very cement came into competition with the best brands of American Portland. The American cement was not allowed to be used, simply because it was American, notwithstanding the company was owned and operated by men of the highest character, widely known and respected in many states of this Union, with experience and ample capital, and their product had always been of the highest grade. No, the engineer could take no chances with an American cement, so he accepted the German cement, knowing absolutely nothing of the men connected with the company; knowing absolutely nothing of the raw material from which it was made, but relying for strength on the sea voyage, and I suppose also on the iron hoop at either end of the barrel. The resulting work was very poor, and in six months' time repairs were necessary, which cost

STONY BROOK CHANNEL, UNDER HUNTINGTON AVENUE, BOSTON, SHOWING METHOD OF STRENGTHENING.

more than the original cement. But it was "imported Portland cement," and covered a multitude of sins—yea, a vast multitude of sins—for three months.

What I would like to impress upon you, is the necessity of careful inquiry as to the methods of manufacture, responsibility and experience of the manufacturers, especially in the chemical department, and whether the aim of the company is quantity or quality. The selling price is a very good barometer of quality. Many mills in Europe and America, that never make any but poor cement, could produce a correct Portland if they so desired, but they consider it more advantageous to starve the quality of their cement, and then rely on plenty of advertising and a cheap price to get rid of it.

A perfect cement is only produced by the employment of the most intelligent, scientific and constant supervision, from correct raw materials, burnt at a great heat, and last, but not least, the grinding of the clinker to a flour—a very expensive item in the manufacture. No part can be slighted either by lack of scientific and practical ability, or by the desire to reduce the cost. We know labor can be too cheap to be valuable, and it is equally true that Portland cement can be too cheap to be good.

Whenever a new Portland cement comes on the market, many engineers refuse it consideration. This is natural with the idea prevailing at present, that testing, at best, only partially discloses the qualities of a cement. Let us treat this matter of Portland cement as we do steel. When steel is manufactured by men of experience and ability, and the product thoroughly tested by competent experts, and found satisfactory, that is the end of the matter, and we *know* that it will stand all we require of it. Knowledge of metallurgy is no doubt more world wide, but it is not more exact or definite than our knowledge of Portland cement, so with a chemical analysis and physical examination, we are able to figure exactly what a certain cement will do with different proportions of sand, and for different periods of time. Should thorough chemical and physical examination show excellence, then with a knowledge of the aims and capabilities of the men manufacturing the cement, we are able to form an exact estimate of the value of the cement.

I place greater importance on lack of uniformity in manufacture and on the failures of a cement than on this or that work where the cement happened to do satisfactory service. There is hardly a brand of cement made that can not point to some good work. This is not sufficient proof of regular quality. We must know whether the men desire to make a perfect cement, and whether, having the desire, possess the ability to accomplish their purpose.

Portland cement is largely an engineer's material, and it should be carefully weighed in the balance of intelligence and treated from a more personal standpoint.

Is the company a promotion scheme, or composed of stock jobbers, placing their product on the market for the sole idea of selling out; or is the company composed of men of integrity and ability, with a purpose to make only the best? Engineers, more than any other class, can, by using only the best, so encourage and stimulate the better manufacturers that contin-

CANAL STREET RELIEF SEWER, BOSTON.

ued improvement will be made in Portland cement, with consequent benefit to all.

Only a few years ago, specifications for fineness called for 90 per cent. to pass the No. 50 sieve (2,500 holes to square inch), the inference being, in the minds of many, that all that passed this sieve was cement, and it is only giving credit where great credit is due, to state here that the fallacy of this proposition was proved by an American cement manufacturer, Mr. William J. Donaldson. Starting with the residue on the No. 50 sieve, Mr. Donaldson found this to be absolutely inert, and of no more value than so much sand. Not to take your time here to mention the trials and labor spent on this investigation, nor to recite the strong and (from some quarters) fierce opposition encountered from the other manufacturers, I will simply state that owing to efforts and investigations, we, to-day, know that no part of a barrel of cement, which has not been ground to a flour (certainly only that portion which will pass the 200 sieve—40,000 holes to the square inch) is active or possesses any cementing qualities. I have grave doubts whether all that passes the 200 sieve is active, but as no finer sieve has yet been made, our conclusions must rest here for the present.

Few of the German, fewer still of the English and American manufacturers, grind finer than 65 per cent. through this sieve, so, were it feasible, the remaining 35 per cent. could be sifted out, and that amount of good sand incorporated with the 65 per cent. of cement flour, and the new mixture would be equal in value to the original barrel of cement. When you buy *cement, buy it.* When you buy *sand*, buy it, but *not* at *cement prices*.

Portland cement is fast growing in favor as a material for general construction, and it may not be known to many that the New York Central depot, in New York City, is being reconstructed, and the entire exterior of the new building will be Portland cement stone.

It is making rapid strides in other directions, proving better and more economical in the form of concrete for bridge abutments and piers than stone masonry; also much cheaper and better than brick for all sewers of the diameter of four feet and over. We are all familiar with the large use of Portland cement for curbing, sidewalks, floors, and other purpose in construction.

It is with justifiable pride that I state that we have in this country inexhaustible material of the finest quality for the manufacture of Portland cement, and there is being made in the United States today cement that is not equalled elsewhere in the world.

FINE GRINDING OF PORTLAND CEMENT.

By C. J. Wheeler, Chemist.

In our preliminary work in connection with our plant during the last year, we have had occasion to test most all of the different Portland cements, both foreign and domestic, used in this country, and some very curious results regarding the fineness and its effects upon

ROCK EXCAVATION FOR WHEEL PITS, CHAPMAN AVENUE PUMPING STATION, BOSTON.

the cements, neat and with sand, were obtained. We noticed that the finer a cement was ground the higher the tensil strain with sand, and lower the neat tensil strain would be.

Some very poor burned American Portlands—one which under a microscope showed at least 25 per cent. of underburnt material in it—gave very high and creditable sand tests but very poor results when tested neat. To determine how fine a properly compounded and well burnt cement should be ground to obtain its greatest efficiency, a number of experiments have been made, and a large number are still under way. A few of the results which we have obtained are given below:

Experiment No. 1—A sample of Portland cement was sifted through a No. 200-mesh sieve—this being the finest mesh sieve that can be obobtained—the residue washed several times with water to free it from adhesive dust and fine cement, and then made into briquettes. These briquettes were allowed to stand twenty-four hours in damp air, and then immersed in water kept between 60 and 70 degrees Fahr. At the end of forty days this cement has shown no signs of setting.

Experiment No. 2—The cement used in this experiment had a residue of 3 per cent. on a 100, and 25 per cent. on a 200-mesh sieve, the initial set taking place in thirty minutes, and set hard in three hours. Tensil strain as follows:

3 days	539	pounds.
7 "	666	"
14 "	681	"
21 "	680	"
28 "	695	"

Sand three parts, cement one part:

7 days	213	pounds.
14 "	283	"
21 "	378	"
28 "	380	"

Experiment No. 3—The same cement as in experiment No. 2, ground to such a fineness that it all passed a No. 200-mesh sieve. The setting time was found to have changed very materially — initial set, five minutes; set hard, ten minutes; tensil strain as follows:

NEAT.

3 days	483	pounds.
7 "	422	"
14 "	598	"
21 "	556	"
28 "		

Sand three, cement one:

3 days	255	pounds.
7 "	366	"
14 "	609	"
21 "	608	"
28 "		

The initial set of the sand and cement in experiment No. 2 was four hours; in experiment No. 3, four and one-half hours. It will be seen by examining the results in experiments Nos. 2 and 3 that the fine grinding decreases the initial set in the case of the neat cement, but does not seem to have any effect upon the sand and cement.

It will also be seen that the tensil strength of the coarse neat cement is much greater than the fine neat cement, but the reverse is true of the mixture of sand and cement.

The finer the cement is ground the higher its tensil strength is with sand.

I would like to say a few words in this place about testing cements. I find that most of the American engineers lay a great deal of stress upon the neat tests; in fact many of them do not use sand at all in testing. I think this is a great mistake, as experiment No. 3 will clearly show. If nothing but results from neat tests were used in passing upon this cement, it would be discarded in most cases, while in fact the sand tests show it to be a cement far above the average. There is one rule which I think

can safely be laid down, and used in passing upon cements, and that is, if a cement is correctly compounded and burnt, the relative value of that cement in practice is directly in proportion to the fineness of the grind. We are now making a large number of experiments on the above lines, in connection with a new system of grinding designed and operated at our works, results of which will be communicated later.

THE POLLUTION OF WATER AND ITS CORRECTION.*

By Reginald E. Middleton, M. Inst. C. E.

From time immemorial running water has been used for two separate and antagonistic purposes, namely, those of water-supply and removal of refuse, and it is a curious fact that the earlier sanitary legislation is directed towards the removal of refuse by sewering or otherwise, rather than to the provision of pure water, and that up to the present date the latter is permissive, the former compulsory. It is necessary, under these circumstances, to enunciate the truism that water is provided in the first place for dietetic and cleansing purposes, and that the removal of refuse by its means must be subordinated to this first and most important requirement.

It must be presumed that there is no such thing as pure water in nature. Even rain-water collects impurities, harmful or otherwise, from the atmosphere, and has ceased to be pure before it touches the ground by which it is further contaminated with animal, vegetable or mineral matter, the amount varying with other conditions until it is found that the washings of a street may be more highly polluted than the contents of a sewer. When the water touches the earth, if the surface be permeable, reaction takes place, and the soil tends to remove the animal and vegetable impurities collected in the water; and to substitute others of a mineral character. Water which has percolated through clean soil and has reached its underground reservoir, has parted with nearly all but its mineral impurities.

Deep well-water, though frequently hard, is, for the above reasons, generally free from the presence of many micro-organisms. This very condition, however, lays it open in a remarkable degree to the attacks of pathogenic germs, if any should find access to it. The ordinary organisms present in water appear to be at war with those of dangerous character, and in their absence the latter have a free field. The same thing may be said of moorland waters, drawn from rocky districts, while much moorland water contains vegetable matter derived from peat, which renders the water unsightly, and is apt to produce diarrhœa in those unaccustomed to its use. The great polluting element is man, whether considered as an individual, or an aggregation of individuals, or as a manufacturer; animal pollutions hold quite a secondary place.

The most serious forms of pollution generally arise from the sewage works of towns or villages, many of which are so situated that

* Condensed from paper read before the British Society of Engineers.

the acquisition of land suitable for the satisfactory disposal of sewage, and the production of a relatively pure effluent, is difficult; the sewage farms or disposal works are seldom of sufficient extent to deal with more than the dry weather flow; therefore, in wet seasons, the sewage is only very partially purified, for dry soil is the essence of the purifying process. Moreover, it is generally accepted that most of the cleansing takes place in the first few inches, decreasing with the depth, and ceasing, or nearly so, when the line of saturation is reached. Many shallow wells, and some deep ones, become contaminated from neglect of this knowledge, the ground around them becoming sodden with clear water as well as with slops and manure, or they are polluted by leaking drains or cesspools, which, being below the surface, are only slightly affected by soil. No chemical treatment of sewage is, by itself, sufficient to produce an effluent of satisfactory purity. The author believes that—as he stated in a paper communicated to the Congress of Hygiene, held in Buda Pest, in 1894—the solution of the problem is to be found in some form of artificial filtration accompanied and aided by biological action. This system also offers immense advantages in dealing with the sewage of large towns in a cheap and effectual manner, and obviates the necessity for the erection of large sewage farms, as well as of large outfall works. It must, however, be worked as carefully as are the filters of a large water-supply, and this is not possible in small villages, the sewage disposal works of which are frequently in a disgraceful condition.

The prevention of pollution may be aided by sedimentation and oxidation in storage reservoirs, by which means, after some twelve days' storage, from 83 per cent. to 96 per cent. of the micro-organisms are removed, and by filtration through sand, which retains an average of 99.6 per cent. of the remaining bacteria. Thus, out of an average number of 24,000 microbes per cubic centimetre contained in river water, only 34 find their way through the filter beds.

DES MOINES CLAYS AND PAVING BRICK.

In a paper read before the Iowa Engineering Society at its recent annual meeting, Mr. E. P. Boynton, city engineer of Cedar Rapids, Ia., reported the results of chemical analyses and tests of Des Moines clays and paving brick conducted by him. The work was done in a very thorough manner. He inspected the plants, studied the shale banks, selected specimens of each distinctive shale, and, through the courtesy of the companies, arranged for the manufacture of distinctive brick from each strata of the shale. His plan of work embraced a chemical analysis of each distinctive shale strata, and tests of these special brick for abrasion and impact, for absorption and for their resistance to cross-breaking, these being the tests usually made by engineers. The results are set forth in the table published on the opposite page. In an introduction to his account of his analyses and tests, Mr. Boynton said:

"It is now but twenty-eight years since the first street pavement of brick was used, and it is only about

DES MOINES IA PAVING BRICK AND CLAYS — RESULTS OF CHEMICAL AND PHYSICAL TESTS

Plate 1

NAME OF BRICK PLANT	SECTION OF CLAY BANK: DESIGNATION OF CLAY & BRICK	No. OF SAMPLE FROM TOP	COLORS OF CLAYS FROM FROM BANK	CHARACTER OF CLAY	DEFINITION BETWEEN STRATA	CHEMICAL ANALYSES OF CLAYS. PER CENT: SILICA SiO_2 TOTAL	ALUMINA Al_2O_3	WATER H_2O COMBINED	CLAY % SAND 1+8=3	OXIDE OF IRON Fe_2O_3	LIME CaO	MAGNESIA MgO	TOTAL ALKALIES	FLUXES (4+6+8+9+10)	WATER H_2O FREE	Fusibility TOTALS	OXYGEN in Acid to oxygen in base 1	OXYGEN in Alumina to Oxygen in Flux 1	PHYSICAL TESTS OF BRICK MADE OF DESIGNATED CLAYS: METHOD OF MANUFACTURE	Number of Samples Tested: Wet	Dry	Burned	AVERAGES: ABRASION AND IMPACT RATTLER TEST ACTUAL	RATIONAL	% Loss	POROSITY ABSORPTION TEST % Gain	TRANSVERSE STRENGTH RUPTURE TEST ACTUAL	RATIONAL	Modulus of Rupture	COMPARATIVE RATING BY FORMULA
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
CAPITAL CITY BRICK & TILE CO	C-0	7	Clear medium light drab with yellow seams of rust	Plastic very slightly gritty	Fair	55.25	25.60	5.07	85.92	5.52	1.75	1.49	1.79	10.55	3.27	99.74	1.93	3.82	Could not be marked - no brick made.													
"	C-1	41	Mottled and streaked maroon and grayish green and purplish brown; dark spots in stone	Shale	Sharp	53.08	24.93	5.73	83.74	9.00	.94	1.84	1.19	12.97	3.29	100.00	1.78	2.95	End cut common	10	7	5	16.91	16.36	16.64	.97	3375	3544	3460	63.79
"	C-2	7	Medium dark bluish drab. Clear	Shale	Sharp	61.18	21.69	5.01	87.88	5.86	.51	1.92	1.96	10.27	1.27	99.42	2.43	3.28	"	10	5	5	18.73	18.73	18.73	1.03	2858	2858	2858	45.48
"	C-3	4	Mottled dark purplish blue and dark gray bright bands of rust	Granular free burning	Sharp	68.60	18.93	2.80	90.33	6.12	.25	.68	.74	7.79	1.80	99.92	3.23	3.80	"	10	10	5	12.91	17.17	15.04	8.60	1714	1714	1714	28.76
"	C-4	16	Clear greenish drab	Fairly short, slightly gritty	Sharp	63.62	16.83	4.10	86.55	8.64	.42	2.00	1.66	12.72	.60	99.87	2.95	2.04	"	10	4	5	18.60	16.61	17.60	.67	3330	3330	3330	63.45
"	C-5	18	Very dark greenish gray slight amount of rust	Shale	Sharp	51.35	27.38	5.42	84.15	6.60	1.45	2.62	2.34	13.01	2.81	99.97	1.62	3.25	"	10	10	5	6349	6349	6349	1.38	1998	1998	1998	— —
DES MOINES BRICK MFG CO	D-1	5	Mottled drab of top with pinkish layers and fine particles dark purple particles a prevailing feature	Granular fluxing	Sharp	70.29	18.18	2.18	87.65	7.32	.80	1.72	1.49	11.33	1.02	100.00	2.27	2.23	"	10	10	5	12.49	12.49	12.49	.60	3423	3423	3423	89.82
"	D-2	4	Dusky cinnamon stage varying to purple with considerable amount of rust. Laminated	Shale.	Four	59.18	21.63	3.80	84.61	5.00	1.06	1.85	1.52	13.43	1.95	99.99	2.21	2.49	"	10	10	5	14.78	14.10	14.44	7.51	2105	2214	2110	38.52
"	D-3	5	Clear Chocolate brown	Shale.	Sharp	64.60	19.20	3.95	87.75	7.68	1.02	1.37	1.25	11.32	.92	100.01	2.75	2.64	"	10	10	5	17.12	13.73	15.42	.86	3231	3374	3303	70.07
"	D-4	5	Solid light sea green with slight seams of rust	Shale.	Variable	64.41	20.43	3.93	88.77	5.88	.34	1.71	1.90	9.83	1.27	99.77	2.71	3.24	"	10	10	5	18.97	18.04	18.51	.72	3896	4158	4027	58.67
"	D-5	3	Buff greenish chocolate bony shale light gray to cream base	Shale	Four	63.23	24.52	2.55	90.30	5.28	.32	.99	1.16	7.75	1.75	99.80	2.42	4.97	"	10	10	5	15.67	15.18	15.42	.82	3515	3515	3515	72.16
"	D-6	10	Breeze light sea green - carrying large nodules of rock	Sandy	Sharp	76.01	11.94	1.41	89.36	5.40	1.57	1.04	1.80	9.81	.65	99.82	4.74	1.98	"	10	10	5	19.55	17.93	18.74	.58	2628	2628	2628	45.14
"	D-7	5	Greenish grey breeze traps	Very Sandy	Four	67.76	14.46	3.53	85.75	8.52	1.16	2.36	1.24	13.28	.67	99.70	3.29	1.65	"	10	10	5	19.55	17.93	18.74	.58	2628	2628	2628	45.14
"	D-8	58	Bluish Grey - Clear	Plastic	Sharp	55.56	21.33	4.65	81.54	10.56	1.59	2.94	2.38	17.47	.97	98.98	1.92	1.89	Could not be marked alone: no brick made.													
ZANE BRICK CO	E-1	6	Top soil and reddish brown, yellowish and white fine grained sandstone	Shale	Sharp	55.98	25.65	3.73	85.36	5.88	.74	1.88	1.95	10.45	3.72	99.53	1.95	3.81	End for Common	10	10	5	12.27	11.43	11.85	3.08	2070	2070	2070	71.40
"	E-2	6	Light yellowish white - variable	Sandy	Four	81.79	10.85	1.27	93.31	3.24	.52	.57	1.75	6.08	.58	99.57	6.61	2.78	"	10	10	5	16.53	14.88	15.60	.82	2812	2812	2812	64.78
"	E-3	5	Running from 1.5 into pale blue 3.6 pale blue at base 4.5 into thin rock about 5.6 into top of bottom	Short body of top & base of bottom	Sharp	68.50	18.45	2.82	89.77	5.28	1.19	1.42	1.27	9.16	.88	99.81	3.17	3.13	"	10	10	5	15.01	14.07	14.54	5.74	1929	2176	2052	44.45
"	E-4	4	Clear Chocolate brown	Shale	Sharp	52.88	24.27	3.28	80.43	11.28	.52	2.03	1.92	15.75	3.46	99.64	1.73	2.39	"	10	10	5	17.01	13.88	15.44	1.39	2765	3203	2984	64.93
"	E-5	3	Dark solid drab with many pea nodules of ferruginous sandy as seen	Granular dark	Sharp	66.73	20.28	4.92	91.93	3.24	.70	.90	1.46	6.30	1.70	99.93	3.11	5.14	"	10	10	5	17.29	15.33	16.61	.54	3086	3086	3086	52.24
"	E-6	13	Bluish drab irregular nodules	Sandy	Sharp	6460	2025	3.74	88.59	6.72	1.20	1.02	1.33	10.27	1.14	100.00	2.72	3.12	"	10	10	5	2312	2053	2182	4.98	2921	2921	2921	11.72
"	E-6A	11	Same strata as E-6 from dark shale into same weathered	Sandy	Sharp	64.82	21.00	3.10	88.92	5.76	.42	2.48	2.11	10.77	.33	100.02	2.61	2.99	"	10	10	5	14.16	13.81	13.98	2.62	2300	2449	2375	63.24
"	E-7	6	Strength of ferruginous and greenish clay with many pea nodules of ferruginous sandy	Shale	Fair	57.25	22.50	3.62	83.37	7.92	.90	2.28	1.41	12.51	3.88	99.76	2.10	2.72	"	10	10	6	No brick made.										
	E-8	24	Clear olive green mixed dark drab	Plastic		53.05	25.92	4.40	83.37	8.76	1.00	2.73	1.29	13.78	2.70	99.85	1.77	2.84	"	10	6	5	14.28	14.28	14.28	.30	3174	3174	3174	57.98
																				10	10	5	28.00	25.00	26.50	.73	2101	2318	2210	— —

Modulus of Rupture = $\frac{3Lw}{2bh^2}$ in which L = distance between supports = 6 in. b = breadth and h = depth of brick, and w = breaking load

Absorption test: bricks dried 72 hours at 176° F and immersed 72 hours in water at 45° F

Comparative rating = (18 - R)6 + (7 - A)4 + $\frac{1}{10}$ in which R = % loss in Rattler test A = % Gain in Absorption Test and T = Modulus of Rupture

Tests by E.P. Bowing C.E. Iowa State College

fifteen years since the question of the adaptability of brick as a paving material became a sufficiently settled fact to warrant the promulgation of its possibilities and the investment of capital in the industry of its manufacture. Up to 1882 nothing but a harder quality of building brick were used, and only a few blocks were paved therewith, but it then became known that a brick could be made so closely approaching the hardness of granite as to give promise of successfully competing with that hard material for a high place among the best of materials for providing a lasting surface for traffic-ways. The use of brick for paving has steadily grown into popular favor in the past eleven years until it has now become one of the settled industries of the country, and it is not presuming too much to anticipate that the coming year will see 40 per cent. of all paving laid to be of vitrified brick. There are almost innumerable localities in this land, so rich in natural resources, where are found clays or shales capable of being transformed into hard brick, and in a large number of instances these are now being worked to a profitable and constantly increasing issue. To the 'clay working industries' is largely due the credit for the constant improvement in their product, and well does it behoove the burner of paving brick, in these days of advanced knowledge and the increasing demand for better construction, to keep up the good work, and, by all means in his power, to keep in the van of the advancing industry. The manufacturer who is constantly studying his material resources, his methods of manufacture and his product, in order that the best material possible may be produced at the least possible cost of manipulation, and in order that he may know the fullest possibilities of his material and the best facilities for its working, is the one who stands prepared to meet the demands of the trade and the one who will enjoy the fullest returns for his wisdom."

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

TABLE OF ORDINATES FOR STREET CROWNS.

Who is the author of the table of ordinates for street crowns, on page 169, March, 1897? Where, except in your files, can I find data on cross-sections of streets?

Robert P. Woods,
City Engineer, Wabash, Ind.

It is stated on the same page that the table is by A. Rosewater, who is city engineer of Omaha, Neb. The table has also been published in one of his annual reports. Similar tables are in use in many city engineers' offices, prepared for their special widths of streets, heights of crown and form of gutter. Mr. Rosewater's table is the only one I have met which attempts to reduce all to the same formula. Two curves are in use, one parabolic, with the vertex at the highest point in the cross-section, and the other circular. The former is the easier to compute, if intermediate ordinates are desired, and the latter is usually considered preferable in form. For narrow roadways there is no appreciable difference between them. A third form of cross-section is composed of two straight

lines from the gutter to the quarter points, connected by a circular or parabolic curve across the crown, tangent to each of the two lines. The height of the crown should be varied with the gradient of the street, as recommended on said page 169. The files of MUNICIPAL ENGINEERING are the source of more detailed information on these subjects than any other publication. The recent books on roads and paving give little attention to the subject.

STANDARD DEPTHS AND WIDTHS OF SOCKETS FOR SEWER PIPE.

What are the standard depths and widths of sockets for sewer pipe?

B. E. B., Erie, Pa.

The first two columns of the following table give the standard depths of socket and the standard annular spaces between the bell and the inserted spigot. The last two columns give the dimensions for deep and wide sockets. All dimensions are in inches:

Diameter.	Standard.		Deep and Wide.	
	Depth.	Space.	Depth.	Space.
8	1¾	⅜	2½	⅝
9	1¾	⅜	...	...
10	1⅞	⅜	2½	⅝
12	2	½	3	⅝
15	2¼	½	3¼	⅝
18	2¼	½	3½	⅝
20	2½	½	3¾	⅝
24	2½	½	4	⅝

DEFECTIVE SYSTEMS OF WATER PIPES.

Our reservoir is nearly two miles from town, at an elevation of 315 feet. The pipe starts 12 inches in diameter and tapers to 6 inches within one-half mile of town, where it is ten feet below the reservoir, its lowest point being about 100 feet below the reservoir. The last half mile is 4 inches in diameter with a fall of 305 feet. When we connect more than two 2½-inch hose with 1⅛-inch nozzle, or even one nozzle, there seems to be lack of power to force water higher than 30 feet. The gauge test at hydrant gives 140 pounds pressure. Is the 4-inch pipe too small? May the cause be the want of an air vent at the end of the 6-inch pipe on top of the hill, or may the entrance to the pipe at the reservoir be plugged? *Sam'l Cole, Dushore, Pa.*

I have condensed this question as I understand it. To give an exact answer the length of each size of pipe and of the hose used should be given and the important elevations of the profile, but there are sufficient data to indicate clearly that the 4-inch pipe is too small. If air vents and mud valves are lacking the trouble will increase in time. Such questions as this can be definitely answered when definite data are given and should be answered before the system is constructed. Too many systems have been constructed without it and too much money wasted.

DIFFERENCE IN DISCHARGE OF WATER FROM 6 AND 8 INCH PIPE.

What would be the difference in discharge of water from a 6 inch and an 8-inch pipe under 300 feet head, the length of main being five miles. Would the friction in a 6 inch pipe be greater in proportion?

W. E. Barker,
Supt. Water-Works, Sydney, N. Y.

If each is flowing at its full capacity the 6-inch pipe will carry about 500,000 gallons a day, and the 8-inch pipe about 1,000,000 gallons a day through this length of pipe, provided the pipe line has a proper profile. With this discharge there would be no head to throw a stream. For the same quantity of water discharged by each pipe the loss of head due to friction in the 6-inch pipe would be more than four times that in the 8-inch pipe.

MEASUREMENT OF WATER WITHOUT A METER.

By what rule, if any, can the supply of water for a community be determined other than by meter, when it is sold by measure? *W. E. Barker,*
Sup't Water-Works, Sydney, N. Y.

The amount consumed can be measured by a common meter, a Venturi meter, or by a measuring weir at the entrance to the pipe. Probably a second weir would be necessary to measure

any waste at flood times. The meter keeps its own record, but, while an automatic recorder could probably be devised which would give sufficiently accurate results, the weir records would require more or less supervision. A properly designed weir well attended will give the best of results.

CITIES THAT PURCHASE WATER FROM SUPPLY COMPANIES.

Can you publish names of cities or villages that purchase their water from supply companies by measure or in bulk, and give about the price paid?

W. E. Barker,
Supt. of Water-Works, Sydney, N. Y.

We do not have the names of such cities or villages at hand, and shall be glad to have our subscribers supply the information desired. The rates to large manufacturing plants, stockyards, and the like, might be some guide. It was proposed to supply Jersey City with a part of its supply in this way, and the supply of Newark is measured, both supplies being furnished by the East Jersey Water Co.

COST OF PUMPAGE OF WATER PER 1,000 GALLONS.

By data furnished in some of the publications, I see that the price of pumpage is given at from 3 to 10 cents per 100 cubic feet. What is the basis of calculation? Is it the cost of coal consumed only? Or are the salaries of engineer and fireman also included? If these, then why not the salary of superintendent, taxes, interest on the investment, and all other expenses of maintenance and operation? In other words, what is the custom among water-works officials in determining the cost of pumpage for 1,000 gallons?

L. D. Lyon, Supt., Watertown, S. D.

The practice regarding reports of cost of pumping is by no means uniform. A committee of the American Society of Municipal Improvements, of which the writer is chairman, has been appointed to make recommendations as to uniform methods of making municipal reports, and will be glad to have suggestions from all who have what they consider to be specially complete and convenient forms. As regards the above question, the first item to be considered is the coal. Some reports give the number of long tons, some of short tons, and some do not state which. Some give an average price per ton based on an average of the prices, and not on the actual tonnage and total cost. Each report should state definitely the number of pounds of coal used, the total cost, the range in prices, and the average price found by dividing the total cost by the number of pounds burned during the year. These are not duty tests, and all the coal used for the legitimate purposes of the pumping station should be counted. The average pressure in pounds, or the average lift in feet, should be accurately given. The total number of gallons (or better, cubic feet) of water pumped during the year, should be given in full, and if there is great fluctuation in rates of pumping it should be noted. It is desirable frequently to have all this information and that described below for each separate engine, for purposes of definite comparison of machinery, but in some stations this is impossible. From the above figures the average duty of the pumping station can readily be determined. Very high duties, reported frequently, indicate that the net coal is reported. If it is, the total coal used and its cost should also be given. It is hardly possible to give too great detail.

In the cost of pumping should certainly be included the cost of labor, of handling coal and of running the machinery. This is as certain-

ly a part of the cost of pumping as the coal. Superintendence and maintenance of the plant, including new machinery and extraordinary repairs, do not have so close a relation to the cost of pumping. While the cost of each should be given fully, they should be counted rather as cost of general maintenance. Any attempt to include the proper proportion of each of these items in the cost of pumping will lead to an indefiniteness in the reports which is just what we are trying to avoid. Cost of oil, waste and such regular supplies other than coal can readily appear as a separate item, and comparison will frequently show where great saving can be made.

The ordinary repairs to machinery should appear as a separate item. Here is an opportunity for indefiniteness, on account of the difference in opinion as to what constitute ordinary repairs to be charged to cost of pumping and what constitute extraordinary repairs to be charged to renewal or extension of plant. Whether extra labor must be employed or the work is done by the regular employes will make a difference in comparing different plants. This item is not large, however, and the variations in judgment make but a few cents variation in total cost.

All these items being given in the form of total cost, it is easy to compute the cost per 1,000,000 gallons pumped to the lift given, and to reduce this to the cost per 1,000,000 gallons pumped 100 feet high, which must be the final basis of comparison between stations. The units used may be different, and one of 1,000 cubic feet 100 feet high would perhaps be preferable. We would be glad to have an expression of opinion as to the best units.

The following extract from a table in preparation will give an idea of the final results ready for comparison, selected for variations in size and conditions. They have been obtained from the reports only after much computation, and in some cases after personal letters to secure omitted data:

City.	Capacity of Station. Gallons per Day.	Cost per 1,000,000 Gallons pumped 100 feet high.				
		Labor.	Fuel.	Oil, etc.	Repairs.	Total.
Chicago	99,000,000	$1 97	$3 61	$0 12	$0 12	$5 82
Mankato, Minn.	3,100,000	2 48	3 37	0 16	0 60	6 61
Newark, N. J.	26,000,000	1 72	1 86	0 35	0 27	4 20
Milwaukee	35,000,000‡	1 44	1 00	0 12	0 08	2 64
Milwaukee	9,000,000†	5 39	2 53	1 05	0 47	9 44

LEAD USED PER JOINT IN DIFFERENT SIZES OF WATER PIPE.

What is the average amount per joint of lead ordinarily used on 4-inch, 6-inch, 8-inch and 10-inch cast-iron pipe.

W. E. Barker,
Supt. Water-Works, Sydney, N. Y.

For 4-inch pipe, 4¼ pounds; 6-inch, 6-¼ pounds; 8-inch, 8¼ pounds; 10 inch, 10¼ pounds of lead per joint, where depth of lead in socket is 1⅞ inches. Under Providence specifications for 4-

inch pipe, depth of joint is 1⅛ inches and weight of lead is 3.31 pounds; for other sizes the figures are 6-inch, 1⅛ inches and 4.73 pounds; 8-inch, 1¼ inches and 6.53 pounds, 10-inch, 1⅜ inches and 8.56 pounds, not allowing for waste, which, with allowance for extra joints, etc., might increase the quantity 25 per cent.

BY WAY OF COMMENT.

Cost of Sewer Maintenance.

There have been few statements of the cost of maintaining sewers on the separate system as complete as that of the city of Brantford, made by the city engineer, T. Harry Jones, The city has a population of 16,000, of which 3,000 are connected with the sewers by 497 connections. The annual increase in population using the sewers is about 500. There are 13.3 miles of sewers and 9.4 miles of house sewers, having 168 manholes and 52 flush tanks. The system was completed in 1892. Monthly inspections of flush tanks are considered necessary, though only two or three of them need some slight attention at each inspection, and about three or four need slight repairing each year. Each tank discharges 200 gallons once a day, and they are sufficient to keep the 9-inch sewers clean, with the exception that occasionally it is desirable to run a tank at the full capacity of the feed pipe for a time. A plunger formed of two rubber disks, backed up by wooden disks, set about 8 inches apart on an iron rod, is pulled through the sewers to clean them out. A plunger, somewhat smaller in diameter than the pipe, is pulled through the sewer by block, beginning with the lowest block and taking each block in succession until the flush-tank is reached. A plunger the same size as the pipe is then pulled through from the upper end to the lower end. Elm strips two inches by one-half inch, bolted together in 12-foot lengths, form a continuous slat to push the plunger rope through from one manhole to the next. Three men will flush about 700 feet in a day with this apparatus. It has been necessary to flush two 9-inch sewers, each once, in this manner in three years.

Two of the 12-inch sewers require flushing once in three months; one on account of a fungus growth, and the other on this account, and because quicksand leaks into it from bad ground and because of the depth below the ground water level at which it was laid, and some defects in its construction. The 18-inch iron "inverted siphon," under the river, is flushed in this manner twice a year. No other sewers need such attention. This work cost for the whole system $127 in 1893, $97 in 1894, and $68 in 1895. Stoppages in house sewers are about 15 in number each year. The cost for the three years has been $30, $25 and $33 respect-

ively. Repairs have cost $128, $130, and $144 respectively. One-half the cost of repairs and flushing with plunger is chargeable to one of the 12-inch sewers. The more important manholes are inspected, and gratings at the foot of the sewers are cleaned once in two weeks. The entire system is inspected twice a year. General maintenance has cost $224 each year. The total cost is $510 for 1893, $475 for 1894, and $469 for 1895, which varies from $40 to $36 a year per mile of sewer, or about $23 a year per mile, including house connections.

The influence of defective construction is shown by the fact that about 25 per cent. of the entire cost is chargeable to the one sewer laid under bad conditions. There is also an indication that increase in use of the sewers decreases the cost of flushing, but sufficiently detailed information is not given, and the time is too limited to make this certain.

Uniformity of Paving Brick Tests.

The Illinois Society of Engineers and Surveyors, at its recent meeting, had a very interesting discussion upon the kind and number of tests of paving brick to be required, and the time that the tests should be applied. All were united in the support of the value of the tests for abrasion, and were practically agreed upon the method of making the tests. Most of those present were in favor of absorption tests and cross breaking tests. Some dropped their preferences for special methods of testing for the sake of uniformity, believing that uniformity is the most important advantage to be gained by the adoption of a standard system of tests. There was a little unwillingness to adopt the report of the committee on tests partly because it did not agree exactly with that adopted by the National Brick Manufacturers' Association, and although the differences were but slight, and were considered by most to be improvements, the report was accepted as one of progress, and the time of consideration of the matter by the committee was extended.

The employment of a good man with a hammer in inspection of brick on the street was emphasized by some as essential to secure the rejection of all poor material, and it was considered a little out of date by others, possibly on account of a slight misunderstanding of the position of the former regarding the use of the two methods in practice. The idea of the former class was evidently that the acceptance or rejection of the individual brick on the street can only be determined by actual inspection and comparison with the standard brick of the same composition and manufacture, which have stood the standard series of tests and have been accepted. In this sense the inspector with his hammer can never be out of date. The place for the standard tests is in selecting a brick of new or untried composition or manufacture, room being made some-

times for similar tests of new shipments of an accepted brick where a variation in quality is suspected. The advantage in uniformity of methods is here evident, for the information obtained by one engineer is available for combination with that obtained by others, and a greater amount of information regarding the action of the brick can be utilized as a basis for accepting or rejecting it for the particular work required of it.

Freezing of Concrete. The question of the effect of freezing upon concrete is one upon which there is considerable difference of opinion. With respect to concrete with natural cements this is due largely to the great variation in reported observations, some stating that freezing has no effect upon the quality of the concrete, some that it has only the effect of retarding the time of setting, some that no injury is done if the cement has time to set before thawing, but the largest number reporting that freezing has the effect of completely disintegrating the concrete. Personal observation of the writer places him in the last class. With respect to Portland cement the reports are more concordant, the consensus of opinion being, with very few exceptions, that frost does not seriously affect Portland cement concrete. Much of the finest stone work on the locks of the Erie canal is done in the winter season and a large proportion of the mortar is doubtless frozen before it has set. The quality of the work is not affected, however, it is reported, except in a few instances, where several alternations of freezing and thawing have been experienced. Careful observations of concrete work, and full reports, including proportions of materials and methods of handling as well as effects of freezing and thawing, are much to be desired.

Street Railways and Street Repair. The rapid growth of public sentiment in favor of good pavements has induced such rapid work in street paving that few cities have had the opportunity, through expiration of charters, to secure from the street railway companies the modifications in the provisions of their contracts, regarding street paving and repair, which are absolutely necessary to durability of pavements next to and between the rails and tracks. The plea of the railway managers that they do not use the pavement and should not be required to pay for it, is as far from equitable as the provision in Philadelphia that the street railway shall pave the entire street. The railway does not use the pavement, to be sure, but its presence in the street causes difficulty in constructing and in maintaining a pavement. The railway should pay at least the additional expense of such construction and repair, the work being done under the same control as the construction and repair of the remainder of the street, and the cost assessed upon the street railway company. If

property owners are relieved of this extra expense, the question of greater payments for franchise privileges can be considered on its merits, without reference to the physical effect of the rails upon the pavement. The larger cars and greater speed now demand heavier track and more solid roadbed. A deep foundation of gravel or broken stone, well drained, with concrete upon this, iron or other durable ties imbedded in the concrete and girder rails, will well repay the extra cost to the railway, and will reduce the repairs of the pavement in the tracks almost as low as those required by the pavement, if without tracks.

This is one of the difficulties which would be obviated by municipal ownership of the railway tracks. If the city owned the tracks and kept them in repair, they could be kept in proper condition with much less difficulty than at present. The use of the tracks could be leased to an operating company with proper provisions for paying these maintenance and construction charges as they were incurred or as a part of the sum settled upon as rental for the system. There are many other similar advantages to be obtained under city ownership. The principal objection to this proposition is not to the principle on which it is based, but to the dishonesty of councilmen who could lease the lines at a rental too low to pay the repairs and fixed charges.

Those cities which are paving extensively are probably awake to the necessities of modifications in their expiring railway charters, and the smaller cities and villages where new companies or suburban lines are asking for franchises should profit by the experience of those before them and secure the proper provisions in the beginning.

State Engineers' Societies. A study of the history of state engineering societies shows that, as a rule, the beginnings of a society are in the desire among the county surveyors or their equivalent for some improvement in their condition. The question of the inadequacy of fees is a very prominent one. The settlement of questions regarding public land surveys, methods of re-running old lines, determination of needle variation, and the like, are freely discussed. Such engineering questions as arise in the surveyor's practice, as the hydraulics of ditches, the construction of roads, the protection of land from overflow, design of bridges and culverts, and so forth, arise at intervals. Usually there are several men competent to consider engineering questions among the members, and if the society grows in size and in value to the state, it rises above the discussions of the inadequacy of fees for services to the consideration of questions which will render the services more valuable. Other engineers are interested; the original designation of the society as the Association of County Surveyors or of Surveyors

and Engineers is changed to the Association of Engineers and Surveyors or the State Engineering Society, and the character of the proceedings follows the change in designation. It is true that no line can be drawn in a definite location so as to separate engineers and surveyors into distinct classes, and that most engineers must also be competent surveyors. It is also true that there are many surveyors who are not engineers. A society which confines itself to the surveyor's problems has a very limited field of usefulness and a very precarious existence. One which broadens out to include the field of engineering is likely to become a strong and influential body.

The Illinois Society is one of the latter. The proceedings of its last meeting would do credit to old established engineering societies, and the work done by its committees and the influence which it exerts upon legislative and executive officers of the cities and towns of the state and the state itself, is strongly felt. Its efforts are directed towards the accomplishment of such objects as uniform tests of brick, improved roadways, sanitary protection of water supplies, sewage purification, the strengthening of the work of the State Board of Health on the engineering side, and like questions of great importance to the people of the state. As a consequence the membership of the society is large and is growing, its influence is increasing, and its stability is assured.

It was hoped for a year or two that the Indiana Society, which has dropped the name of surveyor entirely from its title, would be able to increase its scope, but the reports of its proceedings show that a city engineer, who was proposed for president, was defeated by a small margin because he could not give the required answer to the question "Is he an engineer or a county surveyor?" This spirit of antagonism on the part of the county surveyors has shown itself frequently in that society, and so long as it is allowed an important place in its policy, the influence of the society will likely be small.

Defects in Small Water-Works.

The question regarding the discharge of fire-streams from a four-inch pipe, stated in the question department, reveals a state of affairs which is altogether too common in small water-works. To be sure, while hydraulics is perhaps the simplest branch of engineering in theory, it is probably the most difficult to manage in practice; still there are plenty of engineers with both theory and practice sufficient to obtain the necessary information and to answer questions as to the size of pipe necessary to supply a given amount of water, the pressure that will be obtained, the height of fire streams, whether one or many, and the other practical questions which arise in the preliminary discussion of a water plant. There is no reason for

failure to ask these questions before the plans are adopted, or the franchise granted, but indifference to the needs of the town, and inattention to its affairs. There is no reason for failure to demand detailed answers from those presenting the plans, but the feeling the town councilman has (in common with many of his fellow-citizens), that there is a mystery about the flow of water, and his readiness to accept the statements of the almost equally ignorant promoter that exact answers are not possible, because he can not give them.

The amount of money that has been wasted in constructing water plants in this country which are too small in some vital part, even when sufficient or too large in general, would pay the fees of good engineers for all the works of this class that have been constructed and will be constructed for many years to come. There are many good engineers and many corporations employing good engineers who are in the business of establishing water plants, but there are also many incompetent or dishonest men who are quite unable to determine whether their plans will supply the demands to be made upon them. A fee to an engineer of established reputation for examination of the plans will very frequently save much money in construction, and what is more to the point will secure an adequate system, which will save much money in fire losses and insurance rates, and add to the income by furnishing satisfactory supplies to consumers. If engineers as a body made proper statement of their right to respectful consideration they could be of immense service to the uninformed and conscientious councilman as well as to themselves.

Uniform System of Municipal Reports.

One of the difficulties in making comparisons of methods and work done by various municipalities is the great variation in methods of keeping records and in forms of reports. Some of the differences are unavoidable on account of the fundamental differences in administration, in distribution of work among departments, in methods of letting contracts, paying bills and making assessments. Many of them, especially in the departments of public works, are only apparent and can readily be reconciled and the forms made uniform if an authoritative statement is made of those approved by experts in the matter. The members of the American Society of Municipal Improvements are disposed to do their part towards securing uniformity, and the outgoing president, Mr. August Herrmann, in his annual address, proposed a special Committee on Municipal Data, to formulate a plan for the necessary legislation to establish a national bureau on municipal data. Such a committee was appointed, consisting of Charles Carroll Brown, consulting engineer, Bloomington, Ill., as chair-

man; A. D. Thompson, city engineer, Peoria, Ill., and Lansing H. Beach, captain of engineers, in charge of sewer department, Washington, D. C. The committee has begun its work.

In view of the facts that a new census bureau will soon be established, and that the statistics of municipal public works of the last census were not very valuable, the committee proposes to make some suggestions as to the proper forms for such reports, and the proper questions to ask in order to secure the information that it is possible to obtain, making these the basis for recommendations of general forms of records and reports, and of special forms so far as the fundamental and unavoidable differences in principle will permit of uniformity, or an approach thereto, in methods.

A collection of forms in use and of suggestions, especially from those who have what they consider exceptionally good forms, will be of great assistance, and the individual members of the committee will be glad to receive such from those who are interested in its work. Every one who has tried to compare the work in his own city, with that in other cities, is certainly desirous of securing some approach to uniformity in the manner of presenting the results of work to the public.

CURRENT INFORMATION.

STANDARD TESTS OF CEMENT.

The committee appointed at the annual meeting of the American Society of Civil Engineers, Jan. 20 and 21, 1897, to investigate and report upon the proper manipulation of tests of cements, has recently organized. The committee consists of Prof. Geo. F. Swain, chairman; O. M. Carter, W. B. W. Howe, Alfred Noble, L. C. Sabin, Geo. S. Webster and Herbert W. York. A circular letter of inquiry has been prepared for the purpose of securing the opinions of such engineers as have had experience in testing cement, regarding the proper manipulation to be given to the material and apparatus in various kinds of tests. The opinion of every person who is interested in the subject and has information to impart is desired, whether he be a member of the society or not. Copies of the circular list of questions prepared by the committee will be sent to any address on request. The questions, of which there are more than seventy-five in number, are classified under the heads of "Sampling," "Chemical Analysis," "Microscopic Tests," "Fineness," "Apparent Density or Weight per Cubic Foot," "True Density, or Specific Gravity," "Standard Sand," "Preparation of Pastes and Mortars for Tests of Time of Setting, Soundness and Strength," "Time of Setting," "Soundness," "Tensile Strength," "Compressive Strength," "Transverse Strength."

CENTRAL STATES WATER WORKS ASSOCIATION.

The Ohio Water Works Association held its convention at Columbus, O., Feb. 7 and 8. Jerry O'Shaughnessy, superintendent of the Columbus water works, was elected temporary president, John Fisher of Hamilton, temporary secretary, and A. W. Quenan of Massillon, W. C. Miles of Delaware, T. R. Cook of Toledo and J. J. Pater of Hamilton committee on constitution and by-laws. The first plan was to form a state association, but it was decided to widen the scope and influence, and in accordance with a proposition made by Willis C. Tharp, chief engineer of the Cincinnati water works, the organization was made more comprehensive than a mere state organization. It will be the Central States Water Works Association and will include the states of Ohio, Indiana, Illi-

nois, Kentucky, West Virginia and the western part of Pennsylvania. Its membership will consist of three classes, viz., active, associate and honorary. The active members will consist of superintendents, treasurers, secretaries and skilled public water supply experts. Its associate membership will consist of firms and corporations who manufacture water supplies and their representatives. Its honorary membership will be composed of water works boards and engineers' clubs. The regular annual meeting shall take place in September at the place selected by preceding convention, and the date shall be fixed by the executive committee. The officers are to be a president, four vice-presidents, a secretary, treasurer and editor. John W. Hill of Cincinnati delivered an address Feb. 8, in the chapel of the Ohio State University, on "Sources of Public Water Supply." The officers elected for 1896 were: President, Jerry O'Shaughnessy; secretary, John Fisher; treasurer, Charles E. Rowe. The next convention will be held in Springfield, O.

A STATE LICENSE FOR ENGINEERS.

In his address at the opening of the annual meeting of the Iowa Engineering Society in Cedar Rapids, Ia., the president, Mr. C. B. Allen, spoke of the ethics of the engineering profession. He referred at some length to the qualifications for duty required of engineers, and in speaking of considerations vitally affecting the profession, said:

"To fit himself for successful practice the engineer, perhaps, has spent years in preparation and hundreds of dollars for appliances. He is obliged to buy costly books and journals, take trips to other cities to investigate the latest methods, spending considerable money annually in order that he may keep up with the times. Yet, in his own city and county there are men who are filling merely clerical offices which require no special training, except that the occupant be a fair penman and a courteous gentleman, who receive a greater compensation than the engineer. I am not finding fault with the compensation received in such cases, but refer to them for the sake of comparison.

"I am aware that there have been men in the engineering profession, even filling places in the public service, through political influence, or otherwise, who are responsible in some measure for this, yet a greater part of it comes from want of information concerning this subject. It is only those who are at the head of civic affairs or those who back engineering enterprises with their capital who seem to appreciate to any extent the value of the engineer's services.

"In order that the standard of the profession may be such as to always merit that which we crave, I am of the opinion that, as soon as practicable, a state license law should be enacted, applicable to all engineers and surveyors who shall hereafter enter the field of practice in the state and which shall require them to give evidence of fitness for the same.

"There is much said nowadays about civic reform and no doubt there is need of it. When the same business judgment is used by our municipalities in the selection of their employes, especially as relates to experts or skilled labor, that is used by private corporations, then, and not till then, will there be an improvement in that direction.

"Besides, better treatment should be accorded them. How many a good man has been heard to say upon retiring from a civic office that he could not be hired at any price to accept it again?

"We may well inquire, 'Do not the so-called grinding corporations treat their skilled labor better than do the people theirs?' At least, in the former case they are judged and paid relatively as to their worth.

"When any engineering project confronts the engineer one of the first questions to be considered by him is that of utility, so we may be pardoned if we question the utility of the present methods used in the selection of experts, by our cities in general. I reiterate what has been said by a former president of this society, Mr. Higgins: 'Is there any good reason why an expert must become a partisan in order to secure a place? The writer himself has been told by political leaders in certain places: 'If you belonged to our party we would elect you engineer, but you could not be nominated on our ticket because we have a party worker who wants the place.'

"There now seems to be a tendency to make more and more offices elective, and I am willing to admit that this is the proper method as to certain classes of offices, but those belonging to the class which require experts, or special preparation, should not be so chosen, but should be selected on account of fitness for the particular place."

NEEDED MUNICIPAL LEGISLATION IN OHIO.

The mayors and councilmen of Ohio cities and towns held a convention in Columbus, O., Feb. 7 and 8. Bills will be introduced and recommended to the legislature providing for a more uniform plan of city government for cities and towns, and also for enlarging the scope of the powers of municipalities.

DEVELOPMENT OF A PARK SYSTEM.

The second annual report of the park commission of Essex county, New Jersey, was submitted to Judge Dupue, in the supreme court, Feb. 4, at Newark, N. J. The report is very complete and comprehensive. The lands acquired are classed under four heads, first of which are the neighborhood parks, located necessarily "near the centers of dense population and intended for those who desire, at no great distance, a glimpse of more natural and agreeable surroundings." The commissioners say that they tend more strongly than any other factor in urban life

toward the development and perpetuation of desirable types of humanity. There are two of these parks—Eastside park, containing thirteen acres, and Westside park, containing twenty-eight acres. Under the second division of the system is Branch Brook park, which belongs to that type of landscape art of which Central park in New York City is so prominent an example. It combines the features of both formal and informal landscaping, and while neither a landscape park nor a reservation, partakes of the characteristics of each. The outlying reservation constitute the third class, which consists of wide, picturesque stretches of mountain and meadow and of forest and land. Their natural beauties will be retained, with the additions of holiday resorts, ball grounds, drives and cycle paths through the finest and wildest scenery of Essex county. There are three reservations—Weequahic, Eagle Rock and South Mountain. The first class is a system of parkways, which serve not only for connecting links, but are for the use and pleasure of bicyclists and drivers. They will be elaborated and kept in repair, and will be protected from the risks attendant on cycling or driving on the ordinary highways. The dangers incident to grade crossings will not be permitted to exist in this system, and all grade crossings of railroads or trolleyways will be avoided either by bridge or canal. The location of the county parks will no doubt induce the rapid transit companies to seek ways of approach thereto, and the commission will aid this endeavor so far as in its judgment is consistent with park treatment and use. The commissioners' report states that it has been found impossible to create a park system commensurate with the needs of the county with the $2,500,000 appropriated by the park act of 1895, for the reason that the preliminary board had no power to purchase lands, and so could only estimate approximately their cost. The commission estimates that the sum of $1,500,000 is needed for the more perfect development of the parks, for the acquirement of some further lands to improve the outlines of those parks, and especially for the expense of parkways, the need of which becomes more obvious as the system is developed and appreciated. The park commission sonsists of Cyrus Peck, president; Frederick M. Shepard, Stephen J. Meeker, Franklin Murphy and George W. Bramhall.

A SUCCESSFUL MUNICIPAL LIGHTING PLANT.

The annual report of the electric light committee, at Logansport, Ind., shows satisfactory results of municipal ownership. The report states that all improvements have been made out of the earnings of the plant, paid for originally by the savings over the old system, and the revenues are so much in excess of the needs that the committee feels that it should reduce the cost of incandescent light to consumers. The rate has been 7 cents per thousand watts, and the committee thinks that 5 cents per thousand watts will pay all operating expenses and leave a surplus for unexpected repairs and as a fund to provide for depreciation. The department has received $17,442.53 in cash for private lighting during the year, and is entitled to credit for lighting the public streets, fire department, city buildings, water works and police department in the sum of $13,442.35, making the total earnings for the year $30,884.88. The operating expenses for the year for the entire plant were $11,562.54, leaving as net earnings for the year the sum of $19,322.34. The plant is now the absolute property of the city.

DECREE AGAINST THE CAST IRON PIPE TRUST.

The United States circuit court of appeals for the Sixth circuit rendered an opinion Feb. 14 in the case of the cast iron pipe trust, in which it reversed the circuit court at Chattanooga and instructed that court to enter a decree enjoining the six defendants from continuing to do business under contract of association or from in any way maintaining the same. The court was composed of Judge Harlan and Circuit Judges Taft and Lurton. It will be remembered that this suit was begun in the United States circuit court at Chattanooga by a bill in equity filed by the attorney-general of the United States against the Addyston Co. of Cincinnati; Denniston, Long & Co., Louisville; South Pittsburg pipe works, South Pittsburg, Tenn.; Anniston pipe works, Anniston, Ala.; Howard-Harrison Iron Co., Bessemer, Ala. The suit was to enjoin the companies from continuing to do business under a contract of association which the bill charged was a violation of the federal anti-trust act of 1890, because it was in restraint of interstate trade in cast iron pipe and an attempted monopoly of the same. The circuit court dismissed the bill and the United States appealed. By the contract the defendant divided the country in "free" and "pay" territory. The "free" territory embraced New York, Pennsylvania and Virginia and states north and east of them, in which the associates were permitted to sell pipe at any price they saw fit. The "pay" territory embraced the rest of the United States and all

orders received had to be submitted to a central board, which fixed the price and then assigned the job to the associate which would agree to pay to the others the highest bonus. Certain large cities were reserved to particular members and on orders received from them the price and bonus were both fixed by the board. By the custom of the trade all contracts were made to include delivery by the seller at the home of the buyer.

A WATER COMPANY'S RIGHTS IN MAKING CHARGES.

Judge Alexander of Gallatin, Mo., has rendered a decision in the water works case in Chillicothe, Mo. The case was begun three or four years ago and was argued before Judge Alexander last June, but the importance of the questions involved led him to take the case under advisement. The suit was brought by the citizens of Chillicothe against the Chillicothe Water Works, to compel the company to furnish water at "annual meter rates." Owing to an omission in the recorded copy of the contract between the city and company, the original being lost, the citizens insisted that the company had no right to collect for water at meter rates, except on a yearly basis, which, as the scale was a sliding one, would have practically put every water consumer, however small the amount used, upon the minimum rate. The recorded charter, as shown in the city ordinance, reads:

> The said company agrees to furnish water * * * for domestic and manufacturing purposes at prices not exceeding the following schedule of annual water rates. * * *
>
> Meter Rates.
>
> 100 to 500 gallons, per 100 gallons..... $.....

A full meter schedule in which the quantity increases, then follows, and the rate per 100 gallons decreases, and then follows a large number of other items, some of which were undoubtedly "annual rates" and others were clearly not intended to be so. Some of the rates were: Banks, one basin, $8; boarding houses, each room, $1.50, being annual. Brick work, per thousand laid, 10 cents; brick yard, each table or gang, per season, $20, certainly not annual, etc., but all came under the preamble to furnish at "annual water rates."

The citizens contended that the word "annual" used in the first part of the section controlled the "meter rates," and made the meter rates annual rates, so that the rate a man should pay would be fixed by the amount he used during the year. The company contended that this was a daily rate and showed by a number of eminent water works experts that the words "annual rates" and "meter rates" were the technical terms of the water works business and that they had a diametrically opposite meaning; that where one was used the other could not possibly be; that an "annual rate" was the amount paid for a privilege, that is, for water used for a certain purpose or in a certain place in a year, without reference to the amount used; that "meter rates" meant water used by measurement, without reference to the place where used or purpose for which or the time in which used; that in annual rates there never was any measurement of the quantity used, and in meter rates there was always a measurement. Schedules of other water works companies were cited to show that all schedules of water rates contain a clause showing that the rate was by the day or by the month, and that something must have been omitted in the copying of this charter. Judge Alexander decided in favor of the company, holding that it had a right to make the charges, notwithstanding the silence of its charter on that point.

DAMAGE OF A PAVEMENT BY A STREET RAILWAY COMPANY.

The Indiana Bermudez Asphalt Company has filed suit against the Citizens' Street Railroad Company, at Indianapolis, Ind., for $2,000 to recover damages for the paving on E. Washington-st., from Michigan-ave. to State-st. The charter of the Citizens' Company provides that the company shall keep the street repaired between the tracks and for a space of two feet outside the tracks. The company's failure to do this has led to serious damages to the pavement, and the asphalt company, under its guarantee, was compelled to repair it at a cost of $1,500. Damages are asked for $2,000.

STATISTICS ON THE PRODUCTION OF ASPHALT.

The eighteenth annual report of the United States Geological Survey for 1896-7, which has just been issued, shows that the domestic production of asphalt in 1896 was valued in California at $492,663; Texas, $35,220 and Utah and Colorado, $49,680; total, $577,563. The value of the different varieties was as follows: Crude asphaltum, $78,000; bituminous sandstone, $170,913; bituminous limestone, $21,500; mastic, $900; hard, refined or gum, $92,240; liquid or maltha, $214,010. The total value of the limestone production in the previous year was $348,281. The report contains the usual review on the subject of asphaltum by Mr. E. W. Parker. It is quite full in its treatment of the deposits in Cali-

fornia, Utah and Colorado and contains a special article on those of western Texas by T. Wayland Vaughan. Some statistical information is also added regarding the production of asphaltum in France, Germany and the island of Trinidad. Statistics furnished by Mr. O. E. Thurber, treasurer of the Trinidad Asphalt company, show that the exports of Trinidad Pitch lake asphalt to the United States in 1896 amounted to 60,637 tons and to Europe 20,391, a total of 82,346, against 81,080 the previous year. Statistics are also given showing that the exportation of land asphalt in 1896 was 15,873 tons against 10,320 the previous year.

PROSPECT FOR GOOD STREETS IN ST. LOUIS.

Mayor Ziegenheim's plan for acquiring good streets for the city of St. Louis, Mo., by passing charter amendments, is indorsed by many citizens. The plan was pretty fully outlined in February, 1898, number of Municipal Engineering. The return of the Good Streets Commission from its recent eastern tour, has enabled Mayor Ziegenheim to actively begin his crusade for good streets. He says that if he can only get two amendments to the charter of St. Louis, the city will, within a year, have $20,000,000 worth of new streets. One of the amendments proposed is to annul the 25 per cent. special tax provision, and the other is introducing the installment plan of paying special taxes, under which the property owners are allowed to pay for the streets in six annual installments, instead of being obliged to pay for it all at once.

The Good Streets Commission filed with Mayor Ziegenheim, Feb. 4, a report embodying the result of its visit to several eastern cities for the purpose of investigating methods of street improvement. The report touches chiefly upon the nature and quality of the pavement found in other cities, and the manner in which the original cost of laying the pavement and the cost of subsequent repairs are paid. The commission found that the largest percentage of asphalt pavement was in Buffalo and Washington; that asphalt streets are satisfactory in most instances, but occasionally fail to wear well, showing that a guarantee should always be exacted from asphalt contractors; that the granite streets found elsewhere are no better than those of St. Louis, but better brick were found elsewhere than that used in St. Louis, and cleaner streets—a condition resulting from a greater expenditure of money for cleaning the streets, from the more efficient methods followed, and from the habits of the people in the matter of caring for the streets; different methods of paying for street construction and repair exist, the most common practice being for property owners to pay for the original grading and paving, and the city government for repairs. In Philadelphia grading is paid for by the city. The report recommends that the Municipal Assembly submit to the voters charter amendments which will make it possible to expend upon the streets the money necessary to keep them in good condition. The St. Louis Chronicle, which sent a representative with the commission on its tour, gives a partial list of the benefits likely to accrue from the trip, which is as follows:

The abolition of macadam streets.

The surfacing of many telford and macadam streets with sheet asphalt.

The laying of a vitrified brick or granitoid gutter on asphalt streets to prevent decay of the asphalt.

The daily collection of garbage.

The emancipation of the city from the present electric light combine by the establishment of the feasibility of lighting by Welsbach gas burners.

The ultimate adoption of the grooved girder rail in St. Louis and a consequent solidity in the street where the track abuts it.

Improved methods and apparatus in the street department testing laboratory.

Improvements in the laying of asphalt streets.

The flushing system of cleaning granite block streets.

Improved methods of inspection of street materials.

Contract system of street cleaning, with fines for neglect.

The keeping open for traffic streets and pavements on which buildings are in the course of erction by a system of bridging.

The regulation of projecting street signs.

The cleaning of snow from sidewalks and gutters by abutting property-owners.

The hauling of snow from railroad streets at the expense of the railroad companies.

The use of a durable vitrified brick in St. Louis' streets, instead of the present one.

The use of water-tight sheet iron tanks on garbage collection wagons and their proper disinfection.

The prevention of electrolysis by the insulation of street car rails.

The establishment of a municipal livery stable, shoeing and repair shop.

RESURFACING OF ASPHALT STREETS.

A recent visit was made to several eastern cities by B. J. T. Jeup, city engineer of Indianapolis, Ind., for the purpose of investigating methods of making asphalt repairs elsewhere. He visited Philadelphia, Baltimore, Washington, New York and Wilkesbarre, but found that, with the exception of Wilkesbarre, none of these cities had considered it advisable to own and operate an asphalt plant. In Wilkesbarre he found that a small portable asphalt plant, capable of laying from one to two hundred square

yards of asphalt a day, is operated by City Engineer Ingham. Here the plant is brought to the street to be repaired and the entire process of mixing the asphalt is conducted on the street. The officials of Philadelphia prefer to let the repairs by contract rather than operate their own plant. The city will pay during the present year over $200,000 for resurfacing and repairing asphalt streets. In New York City repaving and repairs are made under a guarantee of fifteen years, at prices, which, compared with other cities, are very high, owing to the long guarantee period and to the amount of money invested for this length of time. In Brooklyn the widest competition is allowed in the repaving of streets, and the prices have been very low, resurfacing having been done at 80 cents a square yard, which price does not include the concrete base. In all these cities asphalt surfaces have been laid on Belgian block and on bowldered streets, where the grade of the street was such as to allow an additional thickness placed on them with good results. The question of placing an asphalt surface on wooden block streets, with a view to improving Delaware street in Indianapolis in such a manner, was investigated by Mr. Jeup, but he learned that this manner of resurfacing has proved very unsatisfactory. He found that in New York City a great amount of asphalt block pavement is now being used and that the city officials are very favorable to this form of pavement. In nearly all of the eastern cities Mr. Jeup found that street railway companies bear their part of the expense of paving streets more than in Indianapolis. In Philadelphia, where the entire central portion of the city is occupied by the trolley lines, the city requires the street railway companies to pave and maintain these streets with asphalt or other material from curb to curb for the entire length of their lines.

LIABILITY FOR PAVING ASSESSMENTS.

The Supreme Court of Iowa has rendered a decision in the case of Vorse vs. Des Moines Marble & Mantel Co. A lease was executed in 1884 on property in Des Moines, running ten years, and providing that the lessee should pay, aside from the annual rental, all taxes and assessments of every kind and nature that might be assessed against the lot, including street paving and curbing, during the continuance of the lease. During 1893 four assessments were made against the lot, two for curbing and one for paving. Certificates were issued and on the back of each the defendants signed a waiver making the assessments payable in installments instead of all at one time. The first installment was paid, but liability on the second and all succeeding payments was denied because the lease expired before it became due. The court holds that, since the defendant company would have had to make full payment when the assessment was made had it not elected to divide the amount into installments, payment is necessary.

SETTLEMENT OF THE AVERILL-BARBER LITIGATION.

The Averill-Barber litigation has been settled upon mutually satisfactory terms. A compromise has been reached by which General Averill is to receive an annuity of $5,000, in addition to about $100,000 for counsel fees and expenses.

PAYMENT OF PAVING ASSESSMENTS IN NEW YORK.

A bill is being prepared for introduction in the New York legislature which proposes an important amendment to the statute providing for the payment of paving taxes in Buffalo, N. Y. Paving assessments in that city are now paid in five installments, one each year, together with the interest. If a property-owner defaults in the payment of the annual interest the whole assessment then becomes due, and the city treasurer is required to turn the matter over to the comptroller, who spreads the whole assessment upon the general city tax. The amendment reads: "If the annual interest is not paid the treasurer should send such interest, together with the installment then due, to the comptroller, to be spread on the general tax-roll of the year." The bill was prepared by Philip Grest, city treasurer of Buffalo.

FRANCHISE OF THE WATER COMPANY AT AUSTIN, TEX.

The federal circuit court at New Orleans, La., has reversed and remanded the case of E. C. Bartholomew, receiver of the Austin Water company vs. the city of Austin, Tex. The action was instituted to recover from the city of Austin the sum of $16,900.83 for water supplied, and rental of hydrants, on a contract entered into between the water company and the city of Austin, April 13, 1882. A general demurrer was entered to the petition as insufficient in law, by the city, and specially excepted to the petition. The circuit court overruled the general demurrer and the first, second, third, seventh and eighth special exceptions, but sustained the fourth, fifth and sixth special demurrers,

and the plaintiff declining to amend, dismissed the action. To this ruling the plaintiff took a bill of exceptions, and thereupon sued out a writ of error. The federal circuit court is of the opinion that the contract upon which this action is based is a grant and privilege for a period of twenty years to the City Water company to supply water to the city of Austin and the inhabitants thereof, with the right of extension under certain named contingencies. The grant is not an exclusive one, and so far as the language is concerned there is nothing to hinder the city of Austin from erecting other and competing works, nor from granting to others the right to use the streets, nor from contracting from others the furnishing of more water, as the needs of the city may require.

TARIFF CLASSIFICATION OF ASPHALT.

The United States board of general appraisers, New York City, gave a hearing Feb. 9, regarding the proper classification of asphalt mastic, after it has been freed from impurities, which are combined with it in a crude state and prepared for shipment. The importers contend that it should come in as a non-enumerated article, when the duty would be in the neighborhood of $1 a ton, while government officers hold that it is a product that has been improved by a process of manufacture and the duty should be $3 a ton.

COST OF HIGHWAYS IN CONNECTICUT.

In his report to the governor, James H. MacDonald, highway commissioner, and under whose supervision state road building in Connecticut is conducted, says the state is eclectic in its road work; that macadam and telford, with the best trap rock, are employed where the towns can afford it, but gravel is used when better materials are too expensive; that a number of gravel roads have been constructed at a cost of not over $1,000 a mile, and that he now has under construction one contract for less than $500. These roads are made of pit gravel, of good binding quality and containing little sand.

DENVER WATER COMPANY'S RATES SUSTAINED.

A decision was handed down, Feb. 8, by Judge Le Fevre, in the water rate case, at Denver, Col., in which he held that the schedule of rates fixed by the Denver Union Water Co., in the fall of 1895, are not too high; that the rates of residences, from which the company receives the bulk of its revenues, are less than could be collected if the terms of the contract were enforced as nearly as they could be under a contract drawn so speciously as this one was; that they do not appear to be harsh, oppressive, nor such as would call forth the court's interference in rendering a general decree; that the defendant company will be entitled to collect from all private consumers of water such amounts as were due and payable on the first day of May and November, A. D., 1897, in compliance with the rates set forth and fixed by the defendant company on November 1, 1895.

WATER POLLUTION AND FILTRATION EXPERIMENTS AT PITTSBURG.

The report of the filtration commission, at Pittsburg, Pa., shows that investigations have been made as to the character of the present water supply and its relation to the public health, and that it has been found that the banks of the Allegheny and Monongahela rivers have received a large amount of sewage; that the investigation has gone far enough to show that the city water is so polluted that the public health is greatly menaced, and that some provision should be made for avoiding the contamination. Two forms of filtration, sand and mechanical, are discussed, and the history of each given and the processes whereby the water is cleared of impurities. The question has arisen as to whether or not the Allegheny river mud will not prove an insurmountable obstacle in connection with the use of sand filters, and whether or not preliminary sedimentation is necessary for sand filtering the water procured from the Monongahela and Allegheny rivers. The unreliable information which is to be had as to bacterial purification which is affected by mechanical filtration has given cause for the commission to feel that it is necessary to make experiments with mechanical as well as sand filters to determine what kind of filtration should be used. It was therefore decided to construct a basin and two small sand filters for experimental purposes and these were constructed in such a way that they represent a section of a large plant. The report says:

"Negotiations with filter companies last year resulted in agreements with the Cumberland Manufacturing Company and the Morrison-Jewell Filtration Company for establishing their filters for experimental purposes. The said filters were completed and put in operation last July. The installation of the mechanical filter has been much delayed. During most of the five months' observation of sand filters their efficiency with the water of the Allegheny river has been in all respects as good as that of similar filters in use elsewhere. During a few periods of moderate flood it has been neces-

sary to scrape the filters frequently, and the purification obtained has been less perfect than at other times. The necessity for preliminary sedimentation at these times has been made apparent. The sand filters have thus far been operated at a rate of 3,000,000 gallons per acre daily."

In relation to the advisability of establishing a plant and the estimate of cost, the commission says the results obtained are not sufficient, and therefore conclusions and opinions are necessarily deferred until the entire investigation is completed and the results known. A committee has been appointed to investigate the feasibility of seeking other sources of supply. The commission deems it of the utmost importance that its investigations be continued for a longer period than at first expected, and, in order to continue in a satisfactory manner, it asks for an additional appropriation of $10,000. The report is signed by Robert Pitcairn, William McConway, G. L. Holliday, H. P. Ford, S. D. Warmcastle, E. M. Bigelow, W. J. Holland, J. Guy McCandless, J. R. Vincent, M. D., William Flinn and James M. Bailey.

PLAN FOR MUNICIPAL OWNERSHIP OF WATER WORKS.

A plan for municipal control of water works is suggested by Augustus L. Mason of Indianapolis, Ind., who would have the legislature enact a law providing for the formation of a separate corporation, to be under the control of the city and vested with the power of eminent domain, which would give it the right to condemn and take for public use the existing water plant. The present owners would be, under the plan, fairly compensated for the property taken from them, the value of it to be fixed by a court of authorized jurisdiction. He would have the stock held by the city, and the directors of the independent corporation would issue bonds for the purchase of the plant, based on its value. Mr. Mason's idea is to not operate the plant for money-making purposes, but rather for the good of the citizens of the city. If any profits accrued they would be for the benefit of the whole people, or the plant should be run so that the business should be barely sufficient to operate and maintain the plant, and the money now being accumulated by a private concern would go into the pockets of the people in the way of reduction in water rates to the patrons.

ELECTROLYSIS IN WASHINGTON, D. C.

The electrolysis of water mains and telephone cables is being considered by Capt. W. M. Black, Engineer Commission, Washington, D. C. In making a test to determine the conditions due to leakage currents, a section was removed from a three-inch pipe used to supply the gas works with naptha from the Standard Oil Company's works, and a difference of potential of 1 volt of 4 amperes was found to exist. A potential difference of from ½ to 4 volts and a current of as high as 5 amperes was found between this pipe and other pipes at hand. C. H. Davis, superintendent of the Naval Observatory, has written that the magnetic instruments at the observatory are useless from the same cause. The commissioners have prepared and transmitted to congress a bill which provides that all street railways using a single trolley ground return system must equip their lines with the double trolley, or some other approved metallic return system.

THE PAVING BRICK INDUSTRY.

The production of paving brick in 1896, according to the report of the United States Geological Survey, declined to 347,167,000 from 381,591,000 the previous year, and the value fell to $2,794,585 from $3,136,472 in 1895. The average value per thousand was $8.20 in 1895 and $8.05 in 1896. The only one of the middle states that increased its product was Indiana, which went from 22,313,000 in 1895 to 41,292,000 in 1896. The price ranged from $15 per thousand in Oregon to $4.14 in Virginia.

STATISTICS ON PORTLAND CEMENT.

According to the information compiled by Mr. Spencer B. Newberry for the eighteenth annual report of the United States Geological Survey, the production of Portland cement in this country in 1896 amounted to 1,543,023 barrels, as compared with 990,324 barrels in 1895, showing an increase of nearly 56 per cent. The imports have been remarkably uniform for the last six years, the total of 1896—2,989,507 barrels—being almost exactly equal to that of 1891. Competition has, in the opinion of Mr. Newberry, brought an unnecessary reduction in the price of cement.

HOW THE SCHEME IS OPERATED.

The name of the organization known as the League of American Municipalities is in danger of becoming one that it will be very undesirable to be associated with. It is doubtful if there is anybody connected with it sufficiently interested to try to save it from ill repute. There is evidence of this in the bad beginning made at the meeting in Columbus, O., when it was permitted to fall into connection with private schemes, and on account of this Mayor Quincy of Boston, the

most prominent municipal officer in attendance, withdrew from the meeting. Such representation as it has had in the few months of its existence since has not been of a character to command respect for it. Reports have been received which show questionable private use of its name. In other directions the methods followed are charlatanic. Letters are being sent to municipalities throughout the country urging them to join the organization, the annual fee for which is from $20 to $60, according to the population of the city. This goes to the support of an office and a secretary in New York. It is represented, as the principal reason for joining, that the league maintains an information bureau and will supply valuable information to the cities belonging to the organization. The secretary is not a man who has expert knowledge of any branch of municipal affairs, and if a question is asked it is submitted to municipal officers with a request for information on the subject. His letter may be answered, but it is more likely not to be, for engineers who have acquired technical knowledge in legitimate professional ways are not as a rule disposed to lend themselves to this kind of charlatanism. They are willing to give information to brother engineers or municipal officers as a matter of courtesy, but it is regarded quite differently when sought by some one paid for getting it and attempting to make money out of handling it. Any municipal officer can send his questions direct to other municipal officers, when it is necessary to appeal to them for information, and will be quite certain to get better attention than it will be possible to obtain through a "bureau of information" conducted on such charlatanic methods

NO POLITICS IN PUBLIC WORK.

Commissioner Moreland, of the Detroit board of public works, declares that in the future no consideration will be given to politics in employing men for public work in his department. He thinks that the business of the public cannot be properly conducted where this is done. He expects much complaint from politicians, but is indifferent to it.

RELATION OF FORESTS TO WATER SUPPLY.

J. T. Rothroch, state commissioner of forestry, in his annual report presents statistics to show that the flow of water in the Schuylkill river is now only about one-third of the volume of ninety years ago. He attributes this to three things: First, that we are passing through a period of less rainfall than formerly; second, that the disastrous change is due to disturbing the former balance of natural conditions by removal of the forests; third, that much of this missing water has been used before it reaches the point or points at which the estimates were made.

PROTECTION OF WATER SUPPLY IN ADIRONDACK MOUNTAINS.

Senator Brush has introduced a bill in the New York legislature authorizing the state engineer and surveyor to investigate and report to the legislature the necessity for protecting the sources of water supply in the Adirondack mountains with a view to storing it so as to provide a future supply of water for the city and towns of the Hudson river valley and of New York City and with a view to its use for canal purposes.

PERSONAL.

Captain James W. Millen, commissioner of the water board, has been appointed commissioner of the board of public works, at Detroit, Mich.

A. D. Marble has been appointed city engineer at Lawrence, Mass.

L. M. Dalgarn has been appointed city engineer at Natchez, Miss.

Major W. L. Alexander has been appointed superintendent of the water works and electric light plant at Union City, Tenn.

Gen. Chas. H. T. Collis, formerly commissioner of public works, New York City, is, with his family, visiting the Mediterranean ports.

The new East River Commission appointed by Mayor Van Wyck, New York City, is as follows: President, Lewis Nixon; vice-president, James A. Boyle; secretary, Smith E. Lane; treasurer, Julian D. Fairchild; commissioners, John W. Weber and Thomas S. Moore.

W. D. Dowling has ben appointed superintendent of water works at Kenton, O.

J. E. Arnistead has been reappointed superintendent of water works at Provo, Utah.

Samuel Parson, jr., New York City, has resigned his office as superintendent of parks, and the office has been abolished.

Chas. H. Tutton, assistant engineer of the bureau of engineering of the board of public works, Buffalo, N. Y., has resigned his position.

Geo. W. Birdsall, chief engineer of the Croton acqueduct, has been made chief engineer of the department of water supply for Greater New York.

Henry Douglas has been appointed superintendent of streets at North Adams, Mass.

The firm of Barrally & Snow, civil engineers, North Tonawanda, N. Y., has been dissolved by mutual consent, Mr. Snow retiring from the firm.

E. O. Young has been elected city engineer at West Covington, Ky.

Jerome Warren has been appointed street commissioner at Putnam, Conn.

Wm. B. Sadler has been elected superintendent of water works at Charles City, Ia.

W. W. Brooks has been elected superintendent of the New Albany Water Works Co. at New Albany, Ind.

J. B. F. Breed has been appointed assistant

engineer of the board of public works at Toledo, O.

Dudley E. Waters has been elected president of the board of public works at Grand Rapids, Mich.

James F. Bidwell has been re-elected a member of the board of water commissioners at Springfield, Mass.

Wm. Wheeler has been elected supervising engineer of the Mystic Valley Water Co., Mystic, Conn.

Chas. C. Martin, M. Am. Soc. C. E., has been appointed chief engineer of bridges in the borough of Brooklyn, New York City.

Geo. T. Roberts and L. W. Eighmy have been promoted to assistant engineers in the department of public works, Buffalo, N. Y.

Leffert L. Buck, M. Am. Soc. C. E., has been retained by the newly appointed bridge commissioners as chief engineer of the new East River bridge, New York City.

John H. Enright, city engineer, North Adams, Mass., has been appointed commissioner of public works, leaving the office of city engineer vacant for the present.

Frank P. Cobb has been appointed city engineer, Maurice Kennedy superintendent of streets and Henry F. Moriarity water commissioner at Chicopee, Mass.

Nisbet Wingfield, M. Am. Soc. C. E., Atlanta, Ga., has accepted the position of commissioner of public works, Augusta, Ga.

R. H. McCormick, first assistant city engineer, Detroit, Mich., has been notified of his dismissal, to take effect February 28.

William S. Clark has been elected city engineer at Meriden, Conn.

G. L. Parkhill has been appointed superintendent of water works at Redwood Falls, Minn.

George J. Dunbaugh has been re-elected president and general manager of the Pueble Water Works, Pueblo, Col.

Daniel McDonald has been appointed street commissioner and E. B. Augur, city surveyor, at Middletown, Conn.

M. F. F. Mallum, McKeesport, Pa., has been appointed road engineer of Allegheny Co., Pa., to succeed F. W. Patterson.

James Johnson, Long Island City, has been appointed chief engineer of sewers in the borough of Queens, New York City.

John Franklin has been elected city engineer at Hudson, N. Y., to succeed Chas. Gore, whose term expires March 1.

Henry Steubing has been appointed to take charge of the new water works at Evansville, Ind., by Chas. Hermany, M. Am. Soc. C. E., the engineer.

Samuel R. Probasco, M. Am. Soc. C. E., has been appointed engineer in charge of all bridges under the jurisdiction of the department of bridges, except the New York and Brooklyn bridge, at New York City.

Dr. J. K. Mitchell read a paper Feb. 7 before the College of Physicians, Philadelphia, Pa., on "The Question of Purification of the City's Water Supply."

Watson B. Eddy has been elected highway commissioner at Salmarca, N. Y.

Prof. H. T. Corey of the department of civil engineering of the University of Missouri has been granted leave of absence and has gone to Europe, where he will remain until September, devoting special study to sanitary engineering.

C. H. Rust has been appointed city engineer at Toronto, Ont., to succeed Edward H. Keating, who resigned recently. Mr. Rust was, for a number of years, deputy city engineer.

John Kenney, water assessor, Jersey City, N. J., died Feb. 5.

A. S. Tuttle delivered an illustrated lecture Feb. 3 before the Brooklyn Engineers Club on "The Brooklyn Water Supply."

Charles Sooysmith, M. Am. Soc. E., of the firm of Sooysmith & Co., New York City, sailed for Europe Feb. 12, to be gone about three months.

Alfred Petry, M. Am. Soc. C. E., formerly assistant engineer of the new water works at Evansville, Ind., has been placed in charge of the construction of the foundations for the permanent pumping stations and the intake pier and tunnel for the new system at Cincinnati, O.

J. J. Booth of the firm of Booth & Flinn, Pittsburg, Pa., has retired from the firm. The business will be continued under the old name by Senator William Flinn and his eldest son, George H. Flinn.

Christopher Harrison has been appointed city engineer at Everett, Mass. David B. Fossenden has been appointed a member of the board of public works and John Graham a member of the park commission.

Frank Gowie has been elected commissioner of highways at Bath, N. Y.

William Walrath has been elected commissioner of highways at Palatine, N. Y.

Charles G. Hill has been elected commissioner of highways at Canajoharie, N. Y.

Charles D. Stucker has been elected superintendent of the Riverton Water Co., Harrisburg, Pa.

W. J. Fay, E. Browning, C. E. Carpenter, N. Nebelung and W. M. McFadden have been elected to the water board at Anaheim, Cal.

Chas. H. Haswell, M. Am. Soc. C. E., has been appointed consulting engineer to the board of public improvements of New York City to succeed Stevenson Towle, M. Am. Soc. C. E.

Peter Milne, formerly chief engineer of the department of city works, Brooklyn, N. Y., has been placed in charge of the distributing systems and mains and the repairing and laying of water pipes in the borough of Brooklyn.

William Lowe will be succeeded as special expert on the plans for the new intercepting sewerage system at Chicago, Ill., by John Atwood.

MUNICIPAL REPORTS.

PEORIA, Ill.—The annual reports of Mr. A. D. Thompson, city engineer of Peoria, Ill., are among the most valuable contributions to official municipal literature. Mr. Thompson shows the ability of the trained writer, as well as the capable engineer, in preparing reports which present the essential local information as a good framework for the more important general knowledge learned from his year's experience and in consequence, they are interesting and valuable to readers who know Peoria best simply as Mr. Thompson's field of operations His last report is just out and it treats a variety of subjects. Attention is called to the action of the council in passing an ordinance for opening competition in asphalt, containing the stipulation that street pavements shall be constructed of the "best quality of asphalt." This stipulation, Mr. Thompson says, is so ambiguous that the question of quality is liable to become one of personal preference. The absence of limitation in the ordinance would be perfectly proper were it possible for the city to give in the specifications definite qualities, based upon tests, to be possessed by the asphalt, or if the guarantee period should be made fifteen or twenty years, without cost to the city, relieving the officials in charge of all responsibility as to the character of the materials used.

It is Mr. Thompson's observation that an asphalt pavement constructed of a mixture which is best suited to the demands of traffic, becomes defaced after two or three winters with numerous irregular cracks, while if the mixture be made sufficiently elastic to resist rupture from contraction, the surface of the pavement becomes badly marked and filled with hollows and depressions, produced by expansion and the action of traffic. This condition is more detrimental to the pavement than the cracking. During the last season he used a mixture which he believed to be best suited to the demands of traffic and endeavored to provide in the construction for the contraction and prevent the formation of the irregular ruptures. This provision consisted in cutting the asphalt surface to the concrete foundation from curb to curb at intervals of fifty feet, thus dividing the pavement into block of this length and the width of the improvement. The separation was effected by cutting with an ordinary trowel after the surface had been compacted with a hand roller. Dry cement was carefully swept into the crevice thus formed after which the surface was thoroughly compressed with a steam roller. The line of separation is scarcely noticeable even in cold weather. It is expected that the contraction due to a sudden fall in temperature will cause only a slightly wider separation of the blocks and not produce ruptures along the entire street. These places will be practically closed by the expansion of the material when the temperature rises and will also assist in preventing the formation of ridges from this cause.

"The co-efficient expansion of the asphalt mixture, being probably about the same as that of iron, it is fair to presume that these small spaces at intervals of fifty feet, will not be sufficient to allow for the lengthening due to expansion if the wearing surface be free to move on the foundation. The manner of laying the material used in the past has presented no obstacle to such action and is one of the chief causes of the buckling of the surface. A method of construction which will bind the wearing surface to the foundation as immovably as possible, assisted by the contraction cracks above noted, should allow the use of a softer and more elastic mixture and prevent the formation of these ridges so detrimental to traffic.

"The specifications governing such work for next season have been modified to procure this object as nearly as possible, and require a construction conforming to the recommendations in my last report. Upon the concrete foundation will be laid a binder coat one inch in thickness and a wearing surface one and one-half inches in thickness, whereas the method previously in use consisted of laying upon the concrete a cushion coat one-half inch in thickness, with a wearing surface two inches in thickness. There is practically no difference in the composition or manner of laying the two coats in the latter method, the cushion acting as a protection only to the concrete in hauling and offering no resistance on the smooth foundation to the expansive force of the mixture. The binder under the new specifications will be composed of broken stone and coal tar or asphaltum, thus forming an asphaltic concrete with a rough surface which will adhere to the cement concrete foundation binding the wearing surface firmly to the same and preventing, in a large measure, the movement by expansion."

The advisability of using an asphalt pavement with a concrete foundation on streets where the subsoil is a yellow or blue clay was questioned by property-owners in Peoria, on the theory that as the clay is generally saturated with water, it freezes and the resulting upheaval produces cracks and ridges in the pavement. An investigation was made by Mr. Thompson. He carefully examined every rupture in asphalt pavements laid upon a clay subsoil and failed to discover a single instance where the surface at these points

was raised above the general surface of the street. The only ridges were found on streets having a purely sand subsoil, and these were caused by the expansion of the asphalt surface on the concrete foundation.

The statement is made that there is no agent in force so destructive to pavements as the openings for various service connections, as it is almost impossible to replace the work in such a manner that a defect will not develop in time. A resolution has been adopted in Peoria prohibiting all such openings in paved streets for a period of five years, except in cases of emergency, and the engineer therefore, as a first step in the improvement of streets, directly notifies all property-owners that all such connections must be made before the pavement is laid.

Mr. Thompson advises that street railway companies should be required to properly ballast their tracks, so as to prevent vertical movement, which is particularly injurious to an adjacent pavement. His suggestions were followed in some instances during the last year.

A solid broken stone concrete base six inches in thickness, and the width of the right-of-way was laid beneath the ties and carried up between them to the asphalt. The first cost of this construction was but slightly greater than the cost of laying granite headers and stretchers next the rail with no concrete beneath the ties. The cost of maintenance and the wear and tear on rolling stock will be materially decreased, and it is hoped the example will prove sufficiently profitable to encourage similar construction on other paved streets of the city.

During the year Mr. Thompson inaugurated a system of experiments to determine the limitation of the efficiency of flush tanks and the principles controlling the circulation of air in sewers. These experiments are not complete, but sufficient data has been gathered to indicate that the system of untrapped storm-water inlets, allowing an unrestricted circulation of air, is not applicable to sewers where the difference in elevation varies from fifty to one hundred feet as it does in a majority of the systems of Peoria. These experiments are being conducted at the present time, and when completed it is hoped they will furnish the data from which a system of proper and inoffensive ventilation may be devised.

HAMILTON, Ont.—The water committee states in its report that the remodelling of the water works to meet the required pressure of eighty pounds has been estimated at nearly $300,000. The standpipe has been raised ten feet, thereby adding four and one-half pounds to the pressure. The cost of operation of the works is, without office expenses, 1 cent per 1,000 gallons; including office expenses, 2 cents per 1,000 gallons; including interest on debentures, 5 cents, and with interest also on total construction, 6½ cents per 1,000 gallons. The total cost amounts to $1,695,004.46. City Engineer Barrow reports that the most important public work during the year was the paving of York-st. with Trinidad asphalt, at an expense of $2.15 per sq. yard., and the construction of a sewage disposal plant. The yearly cost of operating this plant is estimated at $4,161.44.

PAWTUCKET, R. I.—The report of Loren G. Ladd, commissioner of public works, shows that during the last year $58,404 was added to the sinking fund. George A. Carpenter, city engineer, reports that the expenditures on highways amounted to $89,086; on sewers, $32,352, and on water works, $53,221. The cost of the engineering work was 4.6 per cent. The daily average gallons of sewage disposed of at the disposal plant ranged from 36,265 to 68,573. The deposit removed has been at the rate of 5.65 cubic yards per 1,000,000 gallons of sewage treated. The application of sewage to the beds has been at the rate of 100,000 gallons per acre. A table is given showing an analysis of samples for each month.

OMAHA, Neb.—In his annual report Andrew Rosewater, city engineer at Omaha, Neb., says that owing to the difficulty which was encountered when the new administration assumed control last May, it required fully a month to reorganize the department, so that the bulk of the more expensive work could not be begun until October. In the remaining three months, however, over 28,000 square yards of asphalt, 13,000 square yards of brick and 28,000 square yards of macadam were laid, aggregating three and two-third miles, at a cost of about $87,000. In addition to this one and one-third miles of artificial stone sidewalks, .81 miles of brick sidewalks and 2.4 miles of wooden sidewalks and .83 miles of sewers were constructed between June and January 1. The total aggregate contract work completed under directions of the engineering department from June 1 to January 1 exceeds $166,000, and there is a balance of work under contract and in incomplete state which will aggregate in cost $78,400.

Mr. Rosewater believes that, next to asphalt, brick will be in demand as a material capable of developing a smooth surface and

good wearing qualities for first-class traffic streets. He advises that future specifications call for the best quality of repressed paving brick, like those recently laid by the Union Pacific Railroad Co. on S. Fourteenth-street. Mr. Rosewater repeats his recent suggestion regarding the maintenance of asphalt pavements after the guaranty period has expired, v.z., that the expense should be provided for by a special tax against the property benefitted and not made a charge on the entire city.

ALBANY, N. Y.—The forty-seventh annual report of the water commissioners for the year ending Dec. 31, 1897, gives in detail the work of the department and contains many suggestions for the improvement of the service. The water rents for 1898 will remain the same as for the year previous. The first work of the commission, which took charge of the department in 1894, was to see that an adequate supply of water should be furnished, and following this to make the expenses correspond with the work. The expenses for 1897 are believed to make an unprecedented showing, for they are 21 per cent. less than the average expenses for the previous eight years, and are less than the fixed charges of operation for any one year in the last ten or more years. The reduction in expenses has been made notwithstanding that there is 20 per cent. increase in water mains to care for and repair and double the number of valves to control the works, and that an abundant and unfailing water supply is being delivered at a greater pressure than ever before.

HARRISBURG, Pa.—The annual report of E. Mather, president of the board of water commissioners, shows the total operating expenses for the last year to have been, including betterments, extraordinary improvements at Reservoir Park, $20,240.15, leaving a balance of $66,240.13 for the payment of interest on bonds, state tax on loans, and for the general and sinking funds. Deducting the extraordinary expenses, including Reservoir Park, $7,629.60, leaves the net operating expenses, including improvements, $21,540.53. Free water was furnished amounting to $26,123.05.

TECHNICAL AND TRADE MEETINGS.

ILLINOIS SOCIETY OF ENGINEERS AND SURVEYORS.—The thirteenth annual meeting of the Illinois Society of Engineers and Surveyors was held in Peoria, Ill., Jan. 26-28. Recommendations were offered that it be the duty of the chairmen of committees to not only make reports, as has been the custom heretofore, but they shall solicit papers from members upon the subjects within the scope of their committee work, and report to the executive secretary prior to the meetings, thus assisting materially in the preparation of the program; that the constitution be so changed that the executive secretary shall be elected for an indefinite period, subject only to death, resignation or removal, for cause, by the executive board. Officers were elected for 1898 as follows: President, A. D. Thompson, Peoria; vice-president, W. A. Darling, Rock Island; executive secretary and treasurer, Jacob A. Harmon, Peoria; recording secretary, John Quade, Kewanee; trustees, William D. Pence, Champaign; C. C. Brown, Bloomington; S. S. Greely, Chicago. An important paper was presented by Jacob A. Harmon on "Proposed State Supervision of Water Supply and Sewage Disposal," in which he said that Massachusetts is easily the foremost state in America, if not in the world, in the study of its public water supplies and the best means of preventing the pollution of its inland waters, as well as in purifying them when necessary for domestic purposes. From 1886 to the present time the state has had constantly in its service a corps of most competent bacteriologists, chemists and sanitary engineers. These men, each in his respective department, have studied the conditions of the various water supplies and system of sewage in the state, and have developed processes of water and sewage purifications which are of inestimable value to the people of that commonwealth. The knowledge thus acquired is furnished to each city, town or community, as occasion warrants, in a most practical way by the preparation of plans and reports under the direction of these officers of the State Board of Health for betterments of the water supply or sewage disposal systems. To carry out this work Massachusetts has appropriated $30,000 annually for the work of the board, and when plans and reports are required in detail, additional funds are available for that purpose.

In New York no system of sewage can be constructed without approval of the State

Board of Health, and the general rule established by the board is that sewage must not be admitted to any stream or body of potable water without first having been so purified that it will not be a source of danger to persons who may use the water for domestic purposes.

The bill which was prepared by the society and submitted to the Illinois legislature, providing that the State Board of Health should be given supervision of the sources of public water supply and of sewage disposal, is reported as having come out of the senate committee very much enlarged, with the recommendation that it pass, but much opposition to the bill has developed from the lack of appreciation of the benefits which the people would derive therefrom.

ENGINEERS' CLUB OF COLUMBUS, O.—The Engineers' Club of Columbus, O., held its annual meeting Feb. 5, when officers for the ensuing year were elected, as follows: President, Julian Griggs; vice-president, Arthur Williston; secretary and librarian, Harry M. Gates; treasurer, William Michel; directors, W. F. Kelly and E. A. Kemmler.

ENGINEERS' SOCIETY OF WESTERN NEW YORK—The Engineers' Society of Western New York held a meeting in Buffalo Feb. 7, when George W. Rafter, Rochester, discussed the advisability of state regulations governing the practice of engineers and the consequent elevation of the profession to where it rightfully belongs. He said this could best be done by the society, aided by the co-operation of prominent engineers in the state petitioning the legislature for such enactments. A committee was appointed to investigate the subject and report at the next meeting. A resolution was passed requesting the State Superintendent of Public Works to have plans and specifications of proposed work on file in Buffalo, for the benefit of engineers, contractors and other interested citizens.

ENGINEERS' CLUB OF CLEVELAND—The Civil Engineers' Club of Cleveland, O., held its regular meeting, Feb. 8. Walter C. Parmeley read a paper on "Rainfall and Runoff in Relation to Sewage Problems," in which he discussed the theory of sewer discharge combined with many practical suggestions from actual experience. A number of charts were exhibited indicatory of the character, intensity and duration of storms as recorded, showing that those of greatest maximum for short periods may not always tax the sewers so much as others of a more steady downfall. The importance of considering the direction of the movement of prevailing storms, was shown. Where the directions coincide the sewers are more heavily taxed than in other cases. Some new mathematical expressions for the time required for storm water to pass through a sewer of varying diameters were suggested. He proposed to increase the exponent of the area A in the formula for discharge of sewers from 4-5, as commonly used, to 5-6, which gives a relatively larger discharge for large drainage areas, and agrees better with the experience of the city of Cleveland.

NEW ENGLAND WATER WORKS ASSOCIATION—The New England Water Works Association held its quarterly meeting in Boston, Feb. 9. F. H. Crandall, engineer and superintendent of water works, at Burlington, Vt., read a paper in which he gave an account of experiments and data to determine the loss of water from pipes, which was followed by a general discussion. H. G. Holden, superintendent of water works, Nashua, N. H., presented a paper in which he described the method adopted in "laying a 24-inch main under the Nashua river." In a paper on "Experiences in the Arid Southwest," Solon M. Allis, C. E., Malden, Mass., gave an account of the leading physical features and water supplies and river coures of Arizona and Mexico.

MASSACHUSETTS HIGHWAY ASSOCIATION—The Massachusetts Highway Association held its annual dinner in Boston Feb. 8. Officers for the ensuing year were elected as follows: President, Prof. C. F. Allen, Boston; vice-president, S. S. Merrill, Salem; secretary, C. R. Carter, Boston; treasurer, W. L. Dickman, Springfield; directors, A. H. Kimball and Chas. Mills, Winchester.

THE ENGINEERS' CLUB OF ST. LOUIS—The Engineers' Club of St. Louis held its four hundred and sixty-sixth meeting Feb. 2. The program of papers for the year 1898 was announced, among which were the following: "Filtration of Water," M. L. Holman, May 4; "Ethics of Engineering," Chas. C. Brown, June 1; "Repairs to the Mill Creek Sewer," B. H. Colby, Oct. 5; "The Streets of a Modern City," A. N. Milner, Oct. 18; "Roadways," Thos. H. Macklin, Nov. 2.

LEGAL DECISIONS.

[Reported specially for MUNICIPAL ENGINEERING.]

Street Sprinkling by Assessment—By the terms of certain street sprinkling contracts, the amount of work to be done, and consequently of compensation to be paid, were not definitely fixed, and could not be ascertained until the end of the sprinkling season. These contracts were payable only out of the proceeds of special assessments to be made for that purpose. The court held that the board of public works was not required to make monthly assessments to pay for the work, but might wait until the work was completed, and then make one assessment for its entire cost; that it was an implied term of the contracts that the city should have a reasonable time after the completion of the work in which to make and collect such assessment, and that until the expiration of such reasonable time, the contractor was not entitled to interest, as damages for non-payment of the contract price. Keigher vs. St. Paul (Sup. Ct. Minn.) 72 N. W. Rep. 54.

Contracts With Municipalities—One who contracts with a municipality is charged with notice of the statutes limiting the power of such municipality to fulfill such contract. Raton Waterworks company vs. Raton (New Mexico) 49 Pacific Rep. 898.

When House-Owner Cannot Collect for Defective Sewers—A party cannot recover against a city for injury to his houses caused by the set-back to the sewage through the alleged negligence of the city, where he connected his houses with the sewer in such a way as to be in violation of city ordinances; and the fact that the city pumped the water out of his basements will not act as a waiver of the infraction of the ordinances. Breuck vs. Holyoke (Sup. Jud. Ct. Mass.). 45 N. E. Rep. 732.

What Is Not Fraud on Part of City Contractor—Fraud, to render void acceptance by a board of public works of work for a municipal improvement, must be on the part of the contractor in connection with the act of the board in the approval of the work. That the contractor did or did not do the work in compliance with the contract, or that the abutting owner notified the board that the work was not done according to the contract, and they refused to take notice of the information, does not taint the work with fraud. Darnell vs. Keller (App. Ct. Ind.). 45 N. E. Rep. 675.

Raising Street Grade not a Damage—Raising the grade of a street, says the Court of Appeals of New York, by building approaches for a street bridge to abolish grade crossings of a railway is not taking of property of abutting owners, so as to entitle them to damages. Talbot vs. N. Y. & H. R. Co. 45 Northeastern Reporter, 382.

Decisions Regarding Municipal Matters and Public Works—Risks of Contractor—Under a contract with a city to construct a newly-designed apparatus for filtering water, to stand certain tests, the tests and demands made upon it is upon the contractor. Shoenberger vs. Elgin (Sup. Ct. Ill.) 45 Northeastern Reporter 634.

Right of Inspection of Sewer—Under a contract for the construction of a sewer, providing that the certificate of the inspector of materials and work to be appointed by the city should be a condition precedent to the contractor's right of payment, an action by the contractor will not lie to recover damages based upon the increased cost of the work alleged to be due to delay caused by conduct of the inspector in rejecting material which was in fact in accordance with the plans and specifications. The tacit consent of the contractors to the action of the inspector, as manifested by the procurement of other material and continuance of the work, will prevent them from complaining of his action. Montgomery vs. New York City (Ct. App. N. Y.) 45 Northeastern Reporter, 559.

MACHINERY AND TRADE.

CALIFORNIA ASPHALT.

In a recent special edition reviewing the industries of California, the Los Angeles Herald contained an article on the operations of the Western Oil and Asphalt company, which, it states, is now devoting "its attention especially to the marketing of its liquid and solid asphalt for paving purposes, the liquid having already been used with satisfactory results in the cities of New York, Philadelphia, Kansas City, Chicago, Denver, Zanesville, Ogden and Sedalia, and the solid asphalt having been used in the city of Atlanta with satisfactory results. In the city of Los Angeles its paving asphalt is chiefly used for bridge work, two of the most important bridges being paved therewith, and seven now being in the process of paving with the same. Not only has the value of such asphalt for paving been established by the use thereof, but the chemical analysis, which is as follows, shows the

same to be exceedingly rich in those qualities which go to make up a good paving material, to-wit:

Bitumen soluble in carbon bisulphide	98.28
Non-organic matter	.41
Water and substances volatilizing at 300 deg. Fahr.	.61
Organic matter, non-bituminous	.20

"While already the largest plant of its kind in southern California, arrangements are now in contemplation which, if consummated, will probably necessitate at least a doubling of the plant, such plant being capable of indefinite extensions. The facilities for shipping its production are probably not exceeded by any concern in this city, its plant being but a short distance from the Santa Fe railroad and alongside the Southern Pacific track, from which a switch leads directly to its warehouses. By reason of the exceptional richness of its asphalt in bitumen, it is one of the cheapest to buy, the purchaser paying asphalt prices only for a minimum of foreign matter. This institution, instead of being a paying concern, as are so many asphalt companies, confines itself to the extraction and marketing of asphalt, selling to all contractors and consumers alike, without preference."

FAILURE OF COMBINATION OF SEWER PIPE COMPANIES.

The committee appointed to obtain the signatures of sewer pipe manufacturers to the agreement to organize an $11,000,000 corporation out of the companies doing business in Ohio, West Virginia and Pennsylvania, report that several large plants have failed to join the movement, and as a consequence the formation of the proposed company has been practically declared off.

RECENT INVENTIONS.

(Reported specially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for 10 cents.)

598,167.—Drawbridge.—Feb. 1, 1898.—Montgomery Maddell, New York. In this bridge the movable span is pivotally supported upon the upper outer end of a lever, the inner lower end of which is pivotally supported upon the pier. The span is drawn by lifting the end next the pier.

598,158.—Drawbridge.—Feb. 1, 1898.—Montgomery Maddell, New York, N. Y. Similar to the one shown in the preceding, but slightly different in form.

598,281.—Wheeled Scraper.—Feb. 1, 1898.—M. G. Bunnell, Chicago, Ill. The axle in this scraper may be alternately locked to the frame or to the wheel; the front end of the scoop is suspended by limbs from cranks carried by the bar axle and the rear end is connected by a chain with a sliding draft-bar.

598,680.—Excavating Machine.—Feb. 1, 1898.—W. Paulitschke, Moedling, Austria-Hungary.

599,231.—Street Cleaner.—Feb. 15, 1898.—R. W. Furnas, Indianapolis, Ind. A push cart having a scraper mounted at its forward lower corner. Above the scraper and rotating about a horizontal axis is a brush which intermittingly sweeps the dirt accumulated by the scraper up and back into the cart.

A GREAT ROCK CRUSHER.

The No. 8 Gates rock and ore breaker, it is claimed, has the distinction of being the largest rock crusher ever made. The Pittsburg Limestone company, limited, of Newcastle, Pa., report officially as having in fourteen months crushed 23,174 cars averaging twenty-four gross tons each. The working day was ten hours. This gives an average hourly product of over 180 tons for fourteen months. On June 21, 1897, this machine crushed 4,350,000 pounds of rock or 2,175 tons. This means a freight train of nearly 100 cars.

TRADE NOTES.

The Providence Construction Co., Jersey City, N. J., has been incorporated to construct and repair railways, bridges, sewers, wells, canals, docks, etc. The incorporators are Nelson G. Green and R. L. Maynard, New York City; Thomas A. Berry and Lewis W. Moore, Philadelphia, Pa.; A. H. Vanderpool, Orange, N. J.

The R. G. Marcy Manufacturing company, Bluffton, Ind., has been incorporated to manufacture pumps, water works machinery, etc., by G. A. Ullman, Ashland, and R. G. Marcy, J. W. Sharick, J. A. Ullmann and L. H. Marcy, Bluffton.

M. Davelaar & Sons, brick manufacturers of Milwaukee, Wis., will open a new yard for the manufacture of wire-cut and pressed brick.

The Kentucky Portland Cement company has been incorporated to manufacture Portland and hydraulic cement at Valley Station, Ky. The incorporators are H. H. Spears, W. C. Kennedy and S. S. Fcss of Valley Station.

A large shale paving brick plant, seven miles from Rockville, Ind., is being equipped by the Marion Brick company.

The Purington Brick company, Galesburg, Ill., held its annual meeting Jan. 24 and elected officers and directors as follows: President and treasurer, D. V. Purington; vice-president and general manager, W. S. Purington; secretary, Charles H. Chamberlain; directors, D. V. Purington, W. S. Purington, George C. Prussing, S. S. Kimball, W. E. Philips, F. G. Matteson and the Hon. A. A. Smith.

D. V. Purington has been elected president of the Cook County Paving brick company, Chicago, Ill.

The Johnsonburg Vitrified Brick company has been organized at Portland, Me., with the following officers: President, E. H. Milliken, Diering; treasurer, C. A. Hight, Portland.

The Holloway Paving Brick company's plant, North Industry, O., has been sold at sheriff's sale, the City National Bank company of Canton, O., purchasing it for $13,334.

The Leonard & Foley Construction company has been incorporated, with principal offices in Owego, Tioga Co., N. Y., to construct roads, railroads, canals, bridges, tunnels, dams, etc. The directors of the company are: Thos. H. Kemble, Lumberville, Pa.; Wm. S. Rhoades, Henry R. Leonard and Peter R. Foley, Philadelphia, Pa.; Clay Kemble, Glenside, Pa.; Walter C. Ritner and Chas. H. Moore, New York City.

The purchase of a road roller has been authorized at Dover, N. H. Address Alderman McGlone.

The American Cement company, Egypt, Pa., has awarded, according to press reports, a contract for erecting its plant to the Standard Construction company of Egypt.

The Pittsburg Vitrified Paving Brick company, Pittsburg, Kas., is enlarging its plant by constructing three kilns and a new drying house.

The C. A. Brockett Cement company, Kansas City, Mo., and the Kansas City and Ft. Scott Cement company have been consolidated, the new corporation bearing the firm name of the Ft. Scott Cement association. The mills are located at Ft. Scott and the general offices in the Aetna building, Kansas City. The officers of the Ft. Scott Cement association are: President, C. A. Brockett; vice-president, Walter S. Halliwell; treasurer, D. P. Thomas; secretary, Howard McCutcheon.

Hetherington & Berner, Indianapolis, Ind., are building another large portable asphalt plant.

The St. Louis Permudez Asphalt Paving Co., St. Louis, Mo., has been incorporated by Stephen D. Rogers, Herman J. Deickneider, Frank C. Dieckneider, Thomas C. Plumridge, Rudolph F. Du Rosey, George R. Quarles and Michael Fitzpatrick.

The Atlas Cement company of New York City, was awarded the contract for furnishing all the cement to be used in the construction of the new locks and dams in the Monongahela river. The contract calls for the delivery of 200,000 barrels of Portland cement, and involves over $500,000.

The Red Wing Sewer Pipe company, Red Wing, Minn., has elected officers as follows: President, E. H. Blodgett; vice-president, A. G. Henderson; treasurer, F. Busch; secretary and manager, C. E. Sheldon.

The Galesburg Vitrified Brick company, Galesburg, Ill., has re-elected directors as follows: H. P. Wood, F. C. Rice, Robert Chappell, H. D. Judson and E. S. Gunnell.

The North Alton Paving and Fire Brick company, Alton, Ill., has elected officers as follows: President, Edward Rogers; secretary and treasurer, Eben Rodgers; directors, W. E. Smith, Balsar Schiers, E. C. Lemon and H. P. Rodgers.

The Macomb Sewer Pipe company, Macomb, Ill. has elected officers as follows: President, W. F. Bayne; treasurer, A. Eads; secretary, William Frost; directors, I. M. Fellheimer, G. W. Bailey, C. C. Chandler, J. M. Kefer and J. T. Applegate.

The Standard Sewer Pipe company, Rochester, N. Y., has elected directors as follows: M. Kendolf, E. W. Peck, C. W. Voshall, F. N. Kendolf, Frank Taylor, J. Miller Kelly, William E. Werner, A. Vogt and Charles Ross.

The New York State Sewer Pipe company, Rochester, N. Y., has elected W. H. Rogers, E. W. Peck and F. N. Kendolf, directors.

The Toronto Fire Clay company, Toronoto, O., have elected officers for the ensuing year: J. H. McCrady, John McCrady and John H. Horner of Braddock and Charles Rosser of Bellaire.

The Canton & Malvern Brick company, Canton, O., has elected officers as follows: President and manager, John S. Melborn; vice-president, R. S. Shielde; treasurer, Henry A. Wise; secretary, Frank Melbourne.

The Grant Paving company, Omaha, has elected officers as follows: President, W. H. Alexander; vice-president, Guy C. Barton; secretary and treasurer, E. W. Nash; superintendent, John Grant; assistant secretary, A. C. Powers.

Press reports state that a rich deposit of natural cement has been discovered near St. Helena, Cal.

A new cement plant is to be built at Nazareth, Pa. Conrad Miller is a stockholder.

The Monongahela Filtration company, Pittsburg, Pa., has been incorporated to manufacture water filters by Henry Myers, Philadelphia; Dell A. Herrick, Ravenna; Frederick English, Paul E. Cash, Geo. Gallwitzer, Pittsburg.

The Pennsylvania Asphalt Paving company, Philadelphia, has removed its office to the Fidelity building.

The Iriquois Portland Cement company, Buffalo, N. Y., has been incorporated to manufacture Portland cement by J. S. Hertel, E. L. Davis and J. C. Bertrand of Buffalo; A. D. Coffin, Oakfield, N. Y.; W. E. Webster, Batavia, N. Y.

The New York Brick & Paving company, Syracuse, N. Y., has elected the following directors: A. A. Howlett, W. B. Cogswell, J. L. Breed, E. M. Klock, T. J. Leach, Thos. Merriam and J. L. King. The directors have elected officers as follows: President, A. A. Howlett; vice-president, J. L. King; secretary, E. M. Klock; treasurer and manager, J. L. Breed.

The Brunswick Asphalt company has been issued a charter, by the Secretary of West Virginia.

The Chicago Gilsonite Paving & Construction company, Chicago, Ill., has been incorporated by Frank J. Decke, L. L. Loehr and Max Whitney.

The plant of the Lock Haven Sewer Pipe Co., Lock Haven, Pa., is being put in readiness for resuming the manufacture of sewer pipe this spring.

The plant of the Chicago Portland Cement Co. was damaged $100,000 by fire on Feb. 13.

The Dunn Manufacturing company of Pittsburg has issued a little pamphlet containing much information regarding its patent extensible trench braces for supporting the sides of excavations. A number of photographic views of work in progress where the braces were in use are given. It is a good thing for contractors to have at hand and can be obtained by addressing the company.

SELECTIONS FROM THE PRESS.

PARIS SEWER CONSTRUCTION.

In the course of the improvements in the sewerage of Paris, it was decided, in 1894, to construct a new main collecting sewer from the place de la Trinite to the siphon which passes under the Seine at Clichy. The large size of the proposed sewer, known as the Collecteur de Clichy, and the fact that the route passed under important and much-traveled streets, filled with shade trees and carrying tramways, caused the authorities to hesitate about cutting a trench for the conduct of the work. It was therefore decided to adopt a system of tunneling, with such arrangement of shields and supports as would maintain the surface of the roadway intact, and permit the entire work to be carried on below ground, although the top of the sewer arch at places would come within three feet of the surface.

An account of the method and apparatus employed is given in the Annales des Ponts et Chaussees (part I, 1897), showing very clearly how this important and difficult work was accomplished, and demonstrating how possible it is to avoid the upheaval of city streets for such constructions.

The sewer is of oval section, 20 feet wide and 16½ feet high inside, with arched walls averaging 21 inches thick, there being a central channel along the bottom, 13 feet wide by 6½ feet deep, for the flow of sewage, with narrow footways on each side, much the same as in the other main sewers of Paris. The total length of sewer is 3,970 yards, which was divided into two contracts, the first, including that portion without the fortifications, 1,610 yards long, and near the surface of the soil, and the second, 2,360 yards long, within the city limits.

In order to support the soil and the load upon the superincumbent roadway, it was necessary to adopt a metallic shield similar to that devised by Brunel for the construction of the Thames tunnel, and this shield was followed by a system of movable centers, or frames, upon which the masonry was constructed and supported. As there was no liquid mass to be encountered, the end of the shield was left open, the structure really forming an elliptical ring of plate iron with sharp edges, reinforced with angles and braces, and carrying six hydraulic cylinders, by means of which it could be forced forward. The rams of these cylinders thrust back against the masonry ring previously constructed, through the medium of the metallic centerings already mentioned, while a horizontal bucket-conveyor kept the space just back of the shield free from earth as rapidly as the excavation progressed.

The general conduct of the work was simple and will readily be understood with a knowledge of this apparatus. The hydraulic jacks had a stroke of one meter, and, as the earth was excavated in front, the shield was steadily forced forward until the limit of stroke had been reached. The pistons were then drawn in and a metal center erected behind them and the work of filling in the masonry had become sufficiently solid to need no further support. A light platform, carried along the middle of the tunnel, supported by a small track by which the masons were supplied with material, while the excavated earth or other similar material was hauled away below. Thus the work went on continuously.

The interior of the tunnel was kept well-lighted by electricity, and all motive power for ventilating, hauling, pumping, etc., was supplied by electricity. The details were slightly different in the two portions of the work, owing to the different depths at which the tunneling was conducted, but the general construction was practically the same.

By the use of this apparatus, a sewer of 20 feet by 16 feet was thus successfully built for a distance of more than two miles under one of the busiest portions of Paris, the work progressing continuously at the rate of about six lineal yards in twenty-four hours, without causing the slightest obstruction to travel and without deranging the surface-paving. The contract price was about $200 per lineal yard, including the construction of all the apparatus.—Engineering Magazine.

INJURIOUS EFFECTS OF NOISE FROM STREET PAVEMENTS.

Physicians are of the unanimous opinion that the incessant noises of great cities are very deleterious in their effects on the ears and the nervous system and give rise to a variety of nervous diseases which are practically unknown in the country.

Dr. John H. Girdner of New York takes a very decided ground against city noises on account of their injurious and exhausting effects on the auditory apparatus and on the whole nervous system. He is quoted from the North American Review as follows:

"Horses and wheeled vehicles produce by far the greatest amount of the noise in city streets. Asphalt pavements in all streets is, therefore, a sine qua non in reducing noise. Rubber tires also greatly reduce the noise and rattle of carriages, and would be very far from a hardship to the owners. For I am informed, by one of the leading city manufacturers of wagons and carriages, that rubber tires increase the life of a vehicle one-fourth, and reduce the cost of repairs one-half. My contention for less noise is based on the ex-

perience and observation of nearly twenty years' practice of my profession in New York City. And I am satisfied that the irritation caused by the din in which we live today is essentially health-destroying, and plays no unimportant part in producing disease of the brain and nervous system, and delaying the recovery of the sick. This question of noise is not confined to physical well-being; it is also one of morals. It is wrong to inflict needless pain and discomfort on others, no matter which one of the senses is made to convey the painful sensation. The very existence of a properly organized and properly conducted 'Society for the Prevention of Noise' would be a constant reminder to the thoughtless, and a standing menace to the vicious noise-makers, and would in time create a sentiment in favor of peace and quiet, and educate people to respect the rights of others in this matter, just as the Society for the Prevention of Cruelty to Animals has taught all classes to abstain from unnecessary cruelty to the lower animals."

Dr. Samuel H. Durgin, chairman of the board of health, Boston, takes the same stand in regard to the city noises of all sorts. He says that it is impossible to exaggerate their evil influence on people who are weak, nervous or overworked, and even the strong, healthy man, who would rather hear them than not, is subjecting the delicate drum of the ear to a strain that it was never meant to bear. He says that the matter of city noises and their effect upon the public health was seriously considered at a recent meeting of the American Public Health Association, and he believes that civilization demands a reform.—Exchange.

SUCCESSFUL CEMENT MAKING.

In many sections of the United States are found inexhaustible deposits of limestone containing so much magnesia that it is unfit for the manufacture of Portland cement; but it is easily calcined and ground, and, in a neat test, it developes a tensile strength in seven days of 200 pounds, and in twenty-eight days of 300 pounds. Since 1880 this "Rosendale," or natural rock cement, has been used in large quantities. In 1896 the United States produced and used 7,960,450 barrels, at a valuation of $4,049,202, or a trifle more than 50 cents per barrel, in bulk at the mill.

Germany produces annually about 13,500,000 barrels of Portland cement, exporting about 3,000,000 barrels, and consuming the remainder. It is estimated that the United States will consume in 1897 about 4,613,800 barrels of Portland cement, and about 8,000,000 barrels of natural rock cement—a consumption nearly equal to that of Germany. In Germany the use of rock cement has practically ceased, as good Portland cement can be obtained at the works at $1.25 to $1.50 per barrel. In consequence of improved methods the cost of manufacturing in America is constantly diminishing, and if the present fierce competition continues German prices may soon be reached; then the Portland cement will gradually take the place of the rock cement, anad drive it out of the market, as it has done in England and Germany. The excellence of American natural rock cement, and the many ways in which it can be used advantageously, leads me to believe that it has obtained a firm foothold in the United States, which it will keep, regardless of the many predictions of the Portland cement adherents.—E. W. Derby in the Engineering Magazine.

TO KEEP THE STREETS CLEAN.

"After a great deal of thought and patient figuring," he said, "I feel that I can safely say that I have solved one of the great municipal problems."

"Which is?" they asked him.

"Keeping the streets clean," he replied.

"How would you do it?"

"I would assess the cost where it belongs—on men who advertise by means of handbills and circulars," he answered.—Black and White.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Los Angeles, Cal.—A new set of specifications for the construction of macadamized streets has been formulated by City Engineer Dockweiler, after those of other cities where the best results have been obtained. The requirements as to sub-grade, grading foundation and the two coverings of macadam, the under one coarse and the surface coat screened, are set forth.

Jersey City, N. J.—The board of street and water commissioners has adopted new Belgian block specifications, which call for trap rock or syenite, and allow less variation in dimensions than heretofore. The dimensions on the face or upper surface must be between 6 and 8 inches in length, 5 and 6 inches in width and 6 and 7 inches in depth. The dimensions of the base of any block must not differ more than 1 inch from those of the face.

Kansas City, Mo.—The validity of the stand taken by City Engineer Wise, in the matter of letting public works contracts, will be tested, and to that end injunctions were obtained, Feb. 16, by property-owners against every individual member of the city council. All of the injunctions are identically the same, but according to the terms of the petition they are to prevent the Parker-Washington Paving company from laying land asphalt instead of Trinidad asphalt.

New York City—James P. Keating, commissioner of highways, announced, Feb. 14, that he would ask for a bond issue to continue the work of asphalt paving which was begun by the last administration, and if his request is refused he will have to confine himself to carrying out the contracts made by Gen. Collis in 1897.

Indianapolis, Ind.—The specifications for paving the North Side streets have been changed so as to admit Trinidad lake and Bermudez asphalts only.

Kansas City, Mo.—The supreme court of Missouri quashed the mandamus of the Parker-Washington Paving company Jan. 25, throwing it out of the supreme court. The company went direct to the supreme court for a mandamus to compel the city council of Kansas City, Mo., to confirm certain contracts awarded to it by Henry A. Wise, city engineer. In its reply the council alleged that the company had not properly executed its other contracts and the council claimed discretionary rights, and asked that the mandamus be quashed because it was of too small magnitude to be taken up by the supreme court. The court, without going into the merits of the case, sustained the motion, saying that if "every occasion where a party conceives himself aggrieved by the refusal of a city government to close a contract which it ought to make with him, or carry out a contract it has made, this court is to try a series of contested issues to get at the real justice of the municipal action in the premises, the time of the court, now far too short for the treatment of the cases that demand the exercise of appellant jurisdiction, would be seriously encroached upon. It is not to be understood, however, that the court declares that the appellants are entitled to a mandamus."

CONTEMPLATED WORK.

Champaign, Ill.—The question of paving W. Hill-st. is being agitated.

Staunton, Va.—Vitrified brick paving is contemplated for Court Place.

Jersey City, N. J.—Plans have been authorized for the proposed Western boulevard.

Parsons, Kas.—A resolution has been passed to pave Johnson-ave. with macadam.

Macon, Mo.—The roads in the Hudson road district, Macon county, are to be macadamized.

Pontiac, Mich.—About $35,000 worth of brick paving will be constructed in the spring.

Macon, Ga.—Judge Emery Speer is interested in securing asphalt paving for Mulberry-st.

Bath, N. Y.—Paving is suggested for Broadway and Third-sts. and Washington-ave.

Joplin, Mo.—Vitrified brick paving is contemplated for the main business street.

Flint, Mich.—Plans for paving several streets have been approved by the board of public works.

Toledo, O.—Paving is contemplated for Woodville-st., East Side, from Oak-st. to the city line.

Topeka, Kas.—Brick paving is contemplated for Thirteenth and Tyler-sts. Wm. H. Barnes, cy. engr.

Hudson, N. Y.—About 20,000 sq. yds. of macadam paving is contemplated. Chas. B. Gore, cy. engr.

Bluffton, Ind.—The city council has decided to pave Wiley and Central-aves. with brick.

Moundsville, W. Va.—A proposition to issue $100,000 of 5 per cent. road bonds will be voted on March 5. E. M. Lewis, clk.

Pittsburg, Pa.—The proposed improvement of the White Oak Level road will come before the grand jury for approval March 7.

Brooklyn, N. Y.—Asphalt paving is favored for Fourth-ave., from Flatbush-ave. to Sixtieth-st.

CONTRACTS TO BE LET.

Ottawa, O.—Bids are asked until March 17 for paving about 23,279 sq. yds. of Main-Cross-st., with vitrified brick or block. L. H. Huber, clk.

Shelbyville, Ky.—Sealed proposals will be received until March 3 for delivering 800 cu. yds. broken stone on certain streets. L. C. Willis, mayor.

Muncie, Ind.—Bids are asked until March 14 for grading and covering with broken stone Eighth-st., from Beacon to Penn-st. F. A. Elrod, cy. clk.

Atlantic City, N. J.—Bids will be received until March 2 for constructing 6¾ miles of gravel road, from Egg Harbor City to May's Landing. Joseph H. Borton, director.

Humboldt, Ia.—Sealed bids will be received until April 5 for grading or graveling the public highways of Humboldt county during 1898. O. F. Avery, chrmn. bd. supvrs.

Middletown, O.—Sealed proposals will be received until March 18 for constructing cement sidewalks, limestone curbs and gutters and brick sidewalks on a number of streets. J. V. Bonnell, cy. clk.

Toledo, O.—Sealed proposals will be received until March 7 for paving Scottwood-ave., from Virginia-st. to Laskey-ave., with Trinidad asphalt, vitrified brick, blocks or granite blocks. Sealed proposals will be received until March 21 for paving Collingwood-ave., from Ashland-ave. to Cherry-st., with Trinidad asphalt on concrete foundation. Lem P. Harris, cy. clk.

Cincinnati, O.—Sealed proposals will be received until March 18 for paving Wilmink-st., from Central-ave. to Baymiller-st., with brick, and for macadamizing Howell-ave., from Clifton-ave. to Whitfield-st. Aug. Herrmann, prest. B. of A. Sealed proposals will be received until March 5 for improving the road near St. Joseph's cemetery, leading from W. Eighth-st. to Rapid Run Pike, Delhi township. Eugene L. Lewis, co. audt.

Brownstown, Ind.—This township voted Feb. 11 to construct about ten miles of gravel roads.

Morgantown, W. Va.—The new town council will make a systematic plan of permanent paving its main issue.

Carmi, Ill.—A petition for paving one of the principal streets with brick will be presented to the council.

Marshalltown, Ia.—The property-owners on N. Third-st., between Main and Jerome, will petition the council to pave that street.

Norfolk, Va.—The city council is reported as having decided to pave several streets at an estimated cost of $26,000.

Canandaigua, N. Y.—The village board has appointed a committee to investigate the question of vitrified brick paving.

Worcester, Mass.—The city council has recommended asphalt paving for Main-st., from the postoffice to Exchange-st.

Paris, Ill.—(Special.)—C. H. Hodge, cy. clk., says this city will not commence paving now, and cannot tell when it will.

Newport, Ky.—An ordinance has been passed to pave Third-st., from York to Monument, with brick. W. L. Glazier, cy. engr.

Mahanoy City, Pa.—The question of issuing $80,000 bonds for street paving purposes was favorably voted on Feb. 15.

Vicksburg, Miss.—Vitrified brick paving is contemplated for Washington-st. Alderman Warren Smith.

Osburn, Pa.—Macadamizing is contemplated by the council for Broad-st., from east to west borough lines.

Atlantic City, N. J.—The city council has under consideration a bill authorizing an issue of $800,000 worth of paving bonds.

Denver, Col.—A petition has been presented to the board of public works asking that Franklin-st. be paved with asphalt.

Alliance, O.—Resolutions have been passed to pave Main-st., from Arch-st. to the Clarendon & Pittsford railroad tracks with brick.

High Springs, Fla.—The council is reported as having decided to pave N. Twelfth-st. with rock for a distance of one mile.

Houghton, Mich.—(Special.)—C. Brand, cy. clk., says there has been no action taken as yet on the proposed paving of Shelden-st.

Independence, Kas.—An ordinance was passed Feb. 7 providing for paving the two principal business streets with brick.

Worcester, Mass.—Asphalt paving is contemplated for Main-st., and the city engineer has been authorized to procure estimates.

Hampton, Va.—A bill will be presented to the legislature to authorize the council to borrow money for paving and sewers.

Tonawanda, N. Y.—The village engineer has been authorized to make all necessary surveys preparatory to macadamizing Simpson-st.

Evansville, Ind.—(Special.)—George W. Swearingen, clk. B. P. W., says that the city has under consideration paving for fourteen streets, six of which will be asphalt and the remainder brick. It is probable that the contracts will be let on or before May 10, 1898. The work involves about 50,000 sq. yds. of asphalt and 80,000 sq. yds. of brick paving; estimated cost, $340,000.

Bridgeport, Conn.—An appropriation of $77,000 has been asked by the street committee for the construction of permanent improvements.

Peoria, Ill.—The board of public works adopted a resolution Feb. 14 authorizing asphalt paving for Dechman-ave. A. D. Thompson, city engineer.

Elgin, Ill.—Wm. Roundquist, superintendent of streets, recommends in his annual report that North-st., from Dundee to Douglas-ave., be paved with brick.

Marquette, Mich.—According to press reports the village officers of Red Jacket have in contemplation the paving of Fifth-st. with cedar, brick or asphalt.

Mt. Vernon, N. Y.—A petition is being circulated for a 4-ft. asphalt strip next to the curb on First-st., from Scott's bridge to Fulton-ave.

Mason City, Ia.—The city engineer has been instructed to prepare plans for the paving of Main-st., from Willow Creek to Seventh-st., with brick.

Minneapolis, Minn.—A resolution has been passed by the county commissioners to appropriate $4,000 for the improvement of Superior boulevard.

Chester, Pa.—An ordinance was passed by the common council Feb. 7 for curbing and paving both sides of Lloyd-st., between Front and Third-sts.

Utica, N. Y.—Messrs. Foster and Giblin have been appointed a committee to circulate a petition for paving Broad-st., from Park-ave. to the pipe works.

St. Augustine, Fla.—Brick paving has been decided upon for Hospital-st. The question of paving St. George-st. with brick is being agitated.

Omaha, Neb.—The boulevard plans, from Riverview park to the west and northwest, and ending at Twenty-sixth and Burt-sts., have been approved.

Cambridge, O.—Plans and specifications have been ordered for 23,000 sq. yds. of brick paving and 8,000 lin. ft. of curbing in Wheeling-ave. O. M. Hoge, city engineer.

Detroit, Mich.—The property-owners on Gratiot-ave. have presented a petition to the council asking that the present granite paving be resurfaced with asphalt.

Keokuk, Ia.—Mayor Berry and Aldermen Cherrill and Moore have been appointed a local board of improvement to prepare the way for the proposed street paving.

Meridian, Miss.—A bill authorizing this city to issue $20,000 in bonds, to pave Twenty-second and Twenty-fifth-aves., has been approved by the governor.

Savannah, Ga.—The street railway company will be required to pave the spaces between its tracks where it crosses asphalt paved streets with asphalt.

Binghamton, N. Y.—(Special.)—H. Ward says specifications have been ordered prepared for brick and asphalt paving on De Russey-st., from the bridge to Vestal-ave.

Tampa, Fla.—(Special.)—John M. Henderson, deputy cy. clk., says that the streets are to be paved as soon as the sewers are built. Bids for the sewers were received Feb. 28.

St. Paul, Minn.—The board of public works has postponed action on the paving of Nelson-ave., from Summit to Western, and Broadway, from Seventh to Mississippi, until May 1.

Chicago, Ill.—Ordinances were passed, Feb. 5, for six miles of asphalt paving; two miles of granite block paving; seven miles of cedar block paving; three miles of cement sidewalks.

Decatur, Ill.—The property-owners on N. Monroe-st., from W. Eldorado-st. to Packard, and Packard-st., from N. Monroe to Vandyke, have petitioned the city council for paving.

Geneva, N. Y.—(Special.)—E. Seyholt, supt. bd. pub. wks., says that there has been no definite action taken in regard to paving so far, but several streets will probably be paved this year

Troy, N. Y.—A bill has been introduced in the legislature appropriating $65,000 for the improvement of the streets of this city, and if it passes the common council will appropriate $65,000 more.

Monticello, Ind.—(Special.)—City Engineer Bushnell was instructed, Feb. 15, to prepare plans, specifications and estimates for paving with brick or crushed stone, Illinois, Main, Main Cross, Court and Marion-sts.

Indianapolis, Ind.—Resolutions were adopted, Feb. 23, for paving Miami-st., from Delaware to Alabama, with wooden block, brick or asphalt and for a local sewer in Prospect and E. Morris-sts., from McKernan to East-st.

Bridgeport, Conn.—A petition was presented to the board of apportionment, Feb. 16, asking that the estimate submitted to the board for paving Main-st., between Fairfield-ave. and State-st., be granted.

Kansas City, Mo.—Press reports state that a compromise has been effected whereby Brooklyn-ave. will be paved from Fifteenth to the Belt line tracks with brick, and from the Belt line to Twenty-sixth-st. with asphalt.

East St. Louis, Ill.—Ordinances were ordered prepared, Feb. 14, for paving Broadway-st., from Sixth-st. to the Belt line tracks, and Missouri-ave., from the Relay depot to the Belt line tracks, with vitrified brick on concrete.

Quincy, Ill.—The board of local improvements has submitted resolutions for nine blocks of brick paving to City Engineer Chatten for report of estimates of cost. Brick paving is contemplated for a number of streets this year.

Omaha, Neb.—Ordinances were passed by the city council Feb. 15, ordering the repaving of Wirt-st., from Sherman-ave. to Twenty-fourth-st., and a preliminary order was passed for paving Charles-st., from Twenty-sixth to Twenty-eighth.

Milwaukee, Wis.—The board of public works has recommended that Mitchell-st., from Eighth-ave. to Muskegon-ave., be paved with stone, and has suggested that Twenty-ninth-st., from North-ave. to Clark-st., be macadamized and the gutters paved.

Gloucester, Mass.—The city engineer has submitted estimates for macadamizing certain streets as follows: Eastern-ave., $10,000; Washington-st., $63,250; Essex-ave., $47,250; Prospect-st., $5,500; E. Main-st., $6,500; Maplewood-ave., $4,900.

Springfield, Mass.—Chas. M. Slocum, cy. engr., and W. L. Dickinson, supt. sts., have prepared estimates of the cost of replacing the block paving in Main-st., between State and Lyman, with vitrified brick, which is $2.35 a sq. yd., or $33,048.

Toledo, O.—An ordinance was approved Feb. 17 for paving Second-st., from Oak to Platt. Petitions were received also for paving Madison-st., from Superior to Woodruff-ave.; Batavia-st., from Fulton to Ashland-ave.; Colburn-st., from Maumee-ave. to E. Broadway.

Albany, N. Y.—Mayor Van Alstyne voted Feb. 7 to pave Colby-st., from Central to Hunter-ave., and Second-st. and Hunter-ave., from Colby-st. to Watervliet-ave. Estimates have been submitted by Horace Andrews, cy. engr., for paving portions of ten streets with asphalt.

Houston, Tex.—The city engineer has submitted plans and specifications for paving Capitol-ave., from Main-st. to the jail, as follows: Asphalt, on six-inch concrete foundation, $18,385; brick, on 6-in. concrete, $17,642; brick, on sand, $15,413; macadam, $13,184; gravel, $10,212.

Wabash, Ind.—(Special.)—Robert P. Wood, cy. engr., says declaratory resolutions have been adopted for the following: Paving Main-st., from Market to Canal, with asphalt, with combined cement curb and gutters; constructing about 60,000 sq. ft. of cement sidewalks; paving about one mile of streets with macadam.

St. Louis, Mo.—The mayor has signed the bill to widen Twelfth-st., from St. Charles to Washington-ave., and the measure thus becomes an ordinance. An ordinance for paving the street with asphalt, between Market and St. Charles, has already been passed.

Ft. Wayne, Ind.—The board of public works has taken under advisement a petition for asphalt paving on Woodland-ave., from Highland-ave. to Lafayette-st. Samples of asphalt block have been placed on exhibition for the consideration of property-owners on Calhoun-st. The city engineer has been directed to prepare plans and specifications for paving Clinton-st. with brick.

New York City—President Clausen of the park board has decided to construct an asphalt pavement on the plaza at Fifty-ninth-st. and Fifth-ave., similar to that of the circle at Fifty-ninth-st. and Eighth-ave. There is a break of about fifty feet in the asphalt pavement at One Hundred and Tenth-st. and Fifth, which President Claussen will have laid with asphalt, thus making a continuous asphalt pavement the whole length of the avenue. The West End Board of Trade is urging that Fourth-ave., from Flatbush-ave. to Sixteenth-st., be paved with asphalt. James P. Keating, commissioner of Department of Highways, is reported as being in favor of asphalting every street of any importance in Brooklyn and Manhattan. It is his intention to apply to the Municipal assembly for a bond issue of $1,000,000 for asphalt paving.

Indianapolis, Ind.—Resolutions were adopted Feb. 9 for paving a large number of North Side streets south of Sixteenth-st. with asphalt or cresoted wooden block, the choice of pavement being left with the property owners. The asphalt specifications include only Trinidad lake and Bermudez asphalt. The streets to be improved are portions of Tenth, St. Joseph, Pratt, Eleventh, Thirteenth, Twelfth, New Jersey, Fourteenth and Fifteenth-sts. Resolutions for asphalt and block

paving were adopted for Southwestern-ave., from Washington-st. to State-ave. Resolutions were adopted, Feb. 14, for asphalt paving on Ohio-st., from East to Noble, with brick between the street car tracks, and asphalt paving for Twelfth-st., from Central to College-ave. Petitions were filed, Feb. 18, for a creosoted block roadway and cement walks on Massachusetts-ave. to Sixteenth-st., and cement walks on Twenty-second-st., from Bellefontaine-st. to Martindale-ave. Engineers' plans were also ordered for creosoted block paving on Shelby-st., from Southeastern-ave. to the Pennsylvania railroad tracks, and for cement walks on a number of streets.

CONTRACTS AWARDED.

Waterloo, Ia.—A large brick paving contract was awarded, Feb. 15, to the Capitol City Brick company of Des Moines.

Lacon, Ill.—The contract for laying concrete sidewalks and curbing has been awarded to W. J. Parks for $6,000.

Hazelton, Pa.—The bids received, Feb. 4, for constructing 18,000 square yards of brick paving ranged from $1.45 to $2.50 a square yard.

Denver, Col.—The contract for paving Colfax avenue with asphalt has been awarded to the Colorado Paving company at $1.59 a square yard.

Macon, Ga.—The contract for paving the streets of this city with granite cubes was awarded to the Georgia Quincy Granite company at $2.53 a square yard.

Florence, Ala.—The contract for grading and graveling Tennessee street, from Seminary street to Royal avenue, East Florence, was awarded, Feb. 3, to Price, Blair & Smith.

Rochester, N. Y.—The Rochester Vulcanite Paving company secured the contract, Feb. 8, for paving W. Main-st., from Fitzhugh-st. to the canal, with asphalt, for $26,554.25.

Indianapolis, Ind.—The Western Paving and Supply company was awarded the contract, Feb. 2, for paving Alabama-st., from Twenty-third to Twenty-fifth, with asphalt, at $4.13 a foot front on each side.

Columbus, Ind.—The contract for constructing 14,000 square yards of asphalt paving was awarded, Feb. 3, to the Ayres Asphalt Paving company of Zanesville, O., at $1.59 a square yard and 65 cents per lineal foot for curbing.

Maryville, Tenn.—The contract for macadamizing the road extending from this city to the Knox county line and connecting with the Knoxville pike has been awarded to Sheriff Walker of Blount county and Sheriff Groner of Knox county.

Houston, Tex.—Bids were received for paving Carolina, Crawford and Buffalo-sts. with asphalt, brick or macadam. The contract for paving Crawford-st., from Clay to Hadley, was awarded Feb. 14 to A. T. Lucas for $24,680. The street will be paved with brick on a four-inch foundation, with a five-years' guarantee. The other contracts have not been awarded.

Philadelphia, Pa.—Bids were received Feb. 16 for paving Christian-st., from Sixteenth to Twenty-first-st., and from Twenty-second to Gray's Ferry road, with asphalt. The bids varied from $1.20 to $1.90 a sq. yd., according to the character of the foundation and the term of guarantee. The bid of the Alcatraz Paving company, $1.47, was the lowest on a ten-year guarantee.

Burlington, Vt.—Bids were received Feb. 9 for 5,320 ft. of macadam road at Ft. Ethan Allan as follows: Gardner C. Luther, Providence, R. I., $9,257; M. J. Fitzpatrick, Plattsburg, N. Y., $7,911; Frank Pidgeon, Saugerties, N. Y., $8,742; Peter Sheeran, Burlington, $8,336; Geo. A. Rogers, Plattsburg, N. Y., $8,991; Chas. L. Woodbury, Burlington, $7,691. The War Department has recommended that the contract be awarded to Chas. L. Woodbury.

SEWERS.

Washington, Pa.—Judge Taylor has decided that the sewer injunction shall be permanent, and the borough is restrained from letting the contract to R. T. Hallam & Sons.

Detroit, Mich.—The sewer committee has recommended that the property-owners be allowed to petition for either brick or crock lateral sewers, leaving final selection to the board of works.

Mt. Vernon, N. Y.—The State Board of Health has refused to approve the plans of the proposed sewers in Northwest Mt. Vernon on the ground that the sewage from that section would be discharged into the proposed Bronx river sewer.

Chicago, Ill.—Judge Grosscup permitted L. de Zeng to withdraw his bill for an injunction restraining this city from constructing the intercepting sewers, Feb. 21, and permission was given to amend the bill, which, in its new form, will be filed again.

Menominee, Mich.—The United States Circuit Court of Appeals at Cincinnati has decided that the judgment of the Monmouth Mining and Manufacturing company of Monmouth, Ill., against this city for $6,676 on account of sewer pipe furnished for use under a contract with John C. Larson, was obtained on defective legal proceedings. It will, therefore, be necessary to institute a new suit.

Trenton, N. J.—One of the affidavits in the bill recently filed by Jersey City and other complainants to restrain Paterson from polluting the Passaic river, is one from Engineer Alphonse Fteley, in which he said that he examined the Passaic river, commencing at Paterson, and extending down to its mouth at Newark bay; that the conclusion reached was that the sewers which carry their refuse matter directly into the river have become so extensive that the public health is endangered and that the waters of the river are entirely unfit for drinking or any other domestic use whatever; that after studying the subject his conclusion was that it is necessary that the sewage matter should be disposed of in some other way than by permitting it to drain into the Passaic river, and that for several reasons, the best method to follow to dispose of the same would be by conducting the crude sewage to the sea by a trunk sewer, and not permitting it to enter the river at any point.

CONTEMPLATED WORK.

Richmond, Ind.—City Engineer Weber is preparing plans for sewers.

Delta, Col.—The construction of a sewerage system is contemplated.

Madera, Cal.—The establishment of a sanitary district is contemplated.

Ben Avon, Pa.—Plans for the proposed sewerage system have been completed.

Lawrence, Mass.—The Shanty pond and a number of other sewers will be extended.

Wheaton, Minn.—The establishment of a sewerage system is contemplated.

New Ulm, Minn.—The construction of a sewerage system is being urged.

Aurora, Ind.—The council has under consideration a petition for a sewerage system.

Marion, Ind.—City Engineer Overman is reported as making plans for a sewerage system.

Hudson, Wis.—The construction of a sewerage system is contemplated by the council.

Brookfield, Mo.—The city council contemplates the construction of a sewerage system.

Cleburne, Tex.—The city council has decided to construct a first-class sewerage system.

New Brunswick, N. J.—The question of constructing a sewer in the Sixth ward is being agitated.

St. Paul, Minn.—The construction of a sewer is contemplated on Lafond-st. at a cost of $1,000.

Winnebago, City, Minn.—The question of constructing a sewer 2,640 feet long is being agitated.

Bellefontaine, O.—Methods of sewage disposal are being considered, but plans have not yet been made.

Joplin, Mo.—The question of constructing a large main sewer is being agitated in South Joplin.

Sidney, O.—The question of issuing $41,000 in bonds for building a sewerage system will be voted on.

St. Louis, Mo.—An ordinance has been approved for the construction of two sewer inlets on Ninth-ave.

Lexington, Mass.—At a special town meeting Feb. 5 the plan of building sewers was favorably voted on.

East Orange, N. J.—The construction of a new sewer is contemplated by the East Orange township committee.

East St. Louis, Ill.—The construction of a sewer 1¼ miles long is contemplated in Broadway-st.

Benicia, Cal.—A resolution of intention has been adopted for the construction of the West End sewer.

Paris, Ill.—Press reports state that plans and specifications are being prepared for a sewerage system.

Burlington, N. J.—A committee has been appointed by the common council to secure plans for sewering the city.

Flemington, N. J.—The construction of a sewerage system is contemplated. A. B. Kline, cy. clk.

Hudson, N. Y.—The construction of 10,800 ft. of 36-in. brick sewer is proposed. Charles B. Gore, cy. engr.

Plattsburg, N. Y.—Plans for the proposed new sewerage system have been approved by the State Board of Health.

Lisbon Falls, Me.—The question of constructing sewers will be voted on in March. E. E. Coombs, town clk.

Wakefield, Mass.—The question of constructing a sewerage system will be considered at the annual town meeting March 2.

Springfield, Mass.—City Engineer Slocum is preparing information regarding the proposed Mill river sewer for the information of the state board of health, whose approval must be had before construction can begin.

Jewett City, Conn.—Jas. O. Sweet, A. C. Ladd and H. C. Burnham have been appointed a committee to investigate the question of sewage.

Crawfordsville, Ind.—Alvord & Shields, 1140 Rookery Bldg., Chicago, have prepared plans for a complete sewerage system for this city.

Warren, O.—Plans are being prepared for a sewage disposal plant for the Trumbull county infirmary by O. W. Pfouts of Alliance.

Houston, Tex.—The mayor has been ordered to advertise for bids for constructing a sewer along Smith-st., from Capitol-ave. to the bayou.

Santa Ana, Cal.—The proposition to bond this city for $65,000 for a sewerage system was favorably voted on Feb. 5. Ed. Tedford, cy. clk.

Eddystone, Pa.—Press reports state that bids are wanted for the construction of a sewer on Eleventh-st. Jos. Miller, chrmn. st. com.

Dalton, Ga.—The question of constructing a sewerage system and electric light plant will be voted on. B. C. Billings, cy. clk.

Lake Bluff, Ill.—Plans and specifications have been prepared for a sewerage system, but the matter has not been acted upon by the village board.

Columbus, Tenn.—The question of issuing $70,000 in bonds for the construction of a sewerage and water works system will be voted on March 23.

Spencer, Mass.—Sewer extension will be one of the problems considered at the annual town meeting, according to local press reports.

Batavia, N. Y.—The question of constructing a sewerage system will be voted on March 8. A. W. Skelly, J. Holley Bradich, sewer comrs.

Manchester, N. H.—An appropriation of $40,000 for new sewers and $9,000 for repairing sewers has been asked. Samuel J. Lord, cy. engr.

East Liverpool, O.—Plans for the proposed new sewers in district No. 2 have been completed and the question will be voted on in the spring.

Springfield, O.—Plans and estimates have been submitted for trunk sewers in two streets and local sewers in sundry streets. D. S. Snyder, cy. engr.

Elgin, Ill.—Wm. Roundquist, superintendent of streets, in his annual report recommends the construction of a 3x5 ft. brick sewer on North-st., from Gifford to the river.

San Pedro, Cal.—Committees have been appointed by the recently organized improvement league to report on streets, sidewalks, sewerage and water supply.

Cedar Rapids, Ia.—A petition has been presented to council asking for a storm water sewer from First to Fifth-sts., W., between J and K-aves.

Bridgeport, Conn.—The question of constructing a new sewerage system, at an estimated cost of $300,000, is being discussed, according to press reports.

Norfolk, Conn.—A committee has been authorized to secure specifications and estimates for a sewerage system. Burritt Darrow, chrmn. com.

Baltimore, Md.—An ordinance has passed the first branch appropriating $48,000 for the construction of a sewer in Brice alley and Mosher and Payson-sts. A resolution has been offered appropriating $1,800 for the construction of several inlets.

Jeffersonville, Ind.—The citizens have asked congress to appropriate $12,000 to build a sewer from the government depot to the Ohio river.

Newark, N. J.—An ordinance was passed Feb. 17 providing for the construction of a pipe sewer in Washington and Sylvan-aves. and S. Tenth-st. Jas. M. Seymour, mayor.

West Hoboken, N. J.—The ordinance for the construction of sewers in three streets has passed its final reading. Sebastian Maulbeck has been appointed engineer.

Columbia City, Ind.—Press reports state that the city council has decided to proceed at once with the construction of a sewerage system. O. K. Strong, cy. engr.

Buffalo, N. Y.—Plans and specifications have been ordered prepared for a trunk sewer to connect Buffalo river with south city line, at a cost of not over $90,000.

Cleveland, O.—Authority has been asked of the legislature to issue bonds aggregating $2,000,000, part of which are for the continuance of work on the intercepting sewers.

Andover, Mass.—The question of securing a sewerage system may be considered at the annual town meeting in March. John H. Flint, F. G. Haynes and Jas. P. Butterfield may be addressed.

Brooklyn, N. Y.—The citizens of Bay Ridge and Ft. Hamilton are urging the necessity of building sewers. Sewer Commissioner James Kane has asked for an additional appropriation of $92,000 for sewers.

Kent, O.—The construction of a sewerage system and several miles of paving is contemplated this spring. The council has a committee at work securing prices, learning method of procedure, etc.

Memphis, Tenn.—The act authorizing an issue of $500,000 in bonds for the completion of the sewerage system, in both the old and new sections of the city, was passed at an extra session of the legislature.

Bridgeton, N. J.—The construction of the proposed sewerage system is strongly favored by the citizens. Plans have been accepted which contemplate sewage disposal by filtration at an estimated cost of $110,000.

Minneapolis, Minn.—The city councils have ordered sewers constructed in portions of Eighth, W. Twenty-second, Sixth, W. Thirty-third, Beacon, Ontario, Seventeenth, E. Twenty-second and Marshall-sts., and Oakland, Sixteenth, Mount Curve, Hillside, Seventh, Aldrich, Emerson and Fourteenth-aves.

Fond du Lac, Wis.—C. E. B. Parsons, cy. engr., estimates the cost of the sewer and sewage pumping works as follows: 4,900 ft. 36-in., 1,900 ft. 30-in., 1,430 ft. 20-in., 360 ft. 16-in. and 579 ft. 15-in. pipe, 21 manholes, 5 intercepting connections with sewers on five sts., and building for pumping machinery and boilers, from $8,000 to $10,000, making a total cost of from $33,500 to $35,000.

San Francisco, Cal.—Plans have been adopted for a sewerage system for the district bounded by Missouri, Sixteenth, Minnesota and Nineteenth-sts., and for the district bounded by Sixteenth, Minnesota, Twentieth and Michigan-sts. The city engineer has been directed to prepare plans for a sewerage system in the district bounded by Fifteenth-ave., S. Railroad-ave., Twentieth-ave. and First-st. S.

CONTRACTS TO BE LET.

Defiance, O.—Bids are asked until March 11 for constructing a sewer in Ottawa-ave. M. W. Steinberger, city engineer.

Cambridge, O.—Bids will be asked about April 1 for constructing about two miles of 24 to 6-in. pipe sewer. O. M. Hoge, city engineer.

Napoleon, O.—Bids are asked until March 12 for constructing a cylindrical pipe sewer along Main-st. James P. Mason, village clerk.

Tyndall, S. D.—Bids will be received until April 4 for furnishing the county with 12 and 15-in. tiling for a year. W. B. Robinson.

Menominee, Wis.—Bids will be received until March 17 for constructing a sewer from the school building; distance, about 700 ft. O. N. Tweet, city clerk.

Elizabeth, N. J.—Bids are asked until March 1 for constructing 2,575 ft. of 24 and 20-in. pipe and 200-ft. of 12-in. iron pipe sewer. N. K. Thompson, street commissioner.

Toledo, O.—Sealed proposals will be received until March 7 for constructing cylindrical pipe and brick sewers in certain streets. Lem P. Harris, city clerk.

Madisonville, Ky.—Bids will be received until March 1 for constructing a sewer, either open or closed, from Union to Franklin-st. C. O. Osborn, city clerk.

Chicago, Ill.—Sealed proposals will be received until March 7 for constructing intercepting sewers in sections A and B. L. E. McGann, commissioner of public works.

Chicago, Ill.—Sealed proposals will be received until March 4 for constructing sewers in a large number of streets, avenues, courts, places and alleys. L. E. McGann, commissioner public works.

Spokane, Wash.—Bids will be received until March 2 for constructing a sewer with laterals, on Sprague-ave., from Washington-st. to the Mill-st. sewer. B. H. Fowle, secretary board of public works.

Terre Haute, Ind.—Sealed proposals will be received until March 1 for constructing 6 2-3 miles of brick sewers, ranging in diameter from 38 to 80 inches, with manholes, catch-basins, etc. Geo. H. Simpson, city engineer.

Providence, R. I.—Sealed proposals will be received until March 24 for constructing sewage precipitation tanks in section 2, disposal division, at Fields Point, requiring about 51,000 cubic yards of earth excavation and 20,000 cubic yards Portland cement. Robert E. Smith, commissioner public works.

CONTRACTS AWARDED.

Salem, O.—The bids received Feb. 2 for constructing pipe sewers were all rejected.

St. Paul, Minn.—The contract for improving the Cedar-st. sewer, from the river to Eighth-st., has been awarded to John O'Brien for $6,500.

Indianapolis, Ind.—The contract for constructing the Talbott-ave. sewer was awarded Feb. 2 to William Bossert at $3.19 per lin. ft.

Sedalia, Mo.—The contract for constructing sewer No. 15 was awarded to Merritt W. Yeotee of this city for $10,710.

Parsons, Kas.—The contract for building 8,050 ft. of 24 to 12-in. pipe sewers has been awarded to J. M. Hardman of this city.

Dealbeach, N. Y.—The contract for constructing sewers in this place is reported as having been awarded to E. K. Conover of New York City for about $55,000.

Belton, Tex.—Steele & Kelly of Georgetown have been granted a franchise for putting in a sewerage system in this city.

Iowa City, Ia.—The contract for constructing the Capitol-st. sewer was awarded to William Horrabin of this city for $1,904.

San Francisco, Cal.—The contract for constructing a 42-in. brick sewer in N-st. has been awarded to C. B. Williams at $7.40 a ft.

Milwaukee, Wis.—The contract for constructing the Kinnickinnic river flushing tunnel was awarded Feb. 14 to James Markey for $97,696.

Bayonne, N. J.—The contract for constructing the Avenue B sewer was awarded Feb. 1 to M. T. Connelly for $16,500, and for Twenty-fourth-st. sewer for $3,280.

Toledo, O.—Sewer contracts were awarded, Feb. 17, as follows: New York and Payne-aves., Michael Kelly, $13,722.25; Baxter-st., Michael Kelly, $2,349.40; Dexter-st., H. P. Streicher, $974.46.

Depew, N. Y.—The contract for constructing the sewerage system has been awarded to John Miller, 802 Ellicott-st., Buffalo. His bid was $52,996 total and $51,284.55 itemized.

Santa Monica, Cal.—The contract for constructing an outfall sewer 1,250 feet long has been awarded to the Thompson Bridge company of San Francisco for $15,000. The other bids received were: Darby, Laydon & Co., San Francisco, $14,763; J. M. Gardiner, Los Angeles, $15,997; Healey, Tibbetts & Co., San Francisco, $15,470.

Quincy, Mass.—The contract for furnishing and placing in position sewage pumping machinery has been awarded to the Deane Steam Pumping company of Holyoke, Mass., for $11,320. The machinery consists of two compound condensing pumps of 3,000,000 gallons and 5,000,000 gallons capacity a day, auxiliary pumps and two eighty horse-power boilers.

St. Louis, Mo.—Bids were received, Feb. 7, for furnishing the labor and material for taking out of the timber bottom 620 feet of the Mill creek sewer and putting in an 18-inch Portland cement concrete invert as follows: G. Eyermann, jr., $23.60 a lineal foot; Harry F. Heman, $22.50; Heman Construction company, $15; Robert Wycoff, $21; Skrainka Construction company, $26.10; R. J. McDonald, $18.10; H. Rueckling & Co., $15.75. Press reports state that the contract was awarded to the Heman Construction company at $15 per lineal foot.

Springfield, Mo.—E. Plummer of this city has been awarded the contract for sewer work in district No. 4 as follows: For furnishing and laying 8-inch pipe, including Ys, branches and cement joints, 15 cents; lamp holes, each $5; flush tanks, each, $20; manhole for 5 feet and under, each, $23; for all excavation and back-filling under 6 feet deep, per lineal foot, 15 cents; price per lineal foot for all excavation and back-filling 6 feet or over, and under 8 feet, 20 cents; for all excavation and back-filling 8 feet or over, and under 10 feet, 25 cents; for all excavation and back-filling 10 feet or over, and under 12 feet, 35 cents; price per lineal foot for rock trench, per foot in depth, 16 cents.

Pittsburg, Pa.—The contract for constructing a sewer to drain Allegheny cemetery was awarded to Sloan & McIlvaine for about $50,000. The contract for the sewer in Brereton-ave. district was awarded to Ott Bros. for about $25,000. Other sewer contracts were awarded as follows: Southern-ave., C. M. Driver; Webster-ave., Cronin & O'Heam; Watt-st., Ott Bros.; Shakespeare-st., Thomas J. Swaine; Renfew-st., Harvey Sloan; Rone-st., Cronin & O'Heam; Oakland-ave., Harvey Sloan; Morgan-ave., James H. McQuade; Mifflin-st., J. M. Dieterle; Lytle-st., Sweeny & Houston; Kentucky-ave., James H. McQuade; Keystone-st., John A. Ransom; Kincaid-st., James H. McQuade; Holines-st., Ott Bros.; Heberton-st., Harvey Sloan; Howley-st., Sweeny & Sloan; Greenwood-st., Ott Bros.; Fairmount-st., James H. McQuade; Dallas and Frankstown-aves., J. B. Swain; Butler-st., Sweeny & Houston.

WATER-WORKS.

Escanaba, Mich.—The Escanaba water works plant was sold Feb. 14 to H. C. Hodgkins, representing the original owners, for $7,000.

Johnstown, N. Y.—A number of damage suits have been brought against this city for the diversion of water from Cork Center creek for a public water supply.

Williamsport, Pa.—The Muncy water works plant has been sold to the Continental Water Works company of Greensburg, Pa., which will take possession April 1, 1898.

Charleston, S. C.—Mayor Smyth and a special committee from the council have about decided upon a plan for furnishing this city with a better and more abundant water supply. The supply will be brought from the Ediston river.

Helena, Mont.—The Helena Water Works company was sold under foreclosure proceedings Feb. 14 for $300,000, in accordance with a decree of the United States court. The plant was bought by a syndicate of Boston and New York capitalists.

Carthage, Mo.—A mortgage of $50,000 on the water works plant has been ordered foreclosed, and John T. Marshall is named a special master to conduct the sale. The amount due on bonds and coupons is $113,476. The foreclosure sale will take place in April or May.

Duluth, Minn.—The plant of the Duluth Gas and Water company was sold under bond for foreclosure to J. L. Washburn of this city, who represented the English bondholders of the company. E. H. Gay of Boston is to arrange with the English bondholders to transfer the plants to him, and he is to send them to the city.

Newark, N. J.—The board of street and water commissioners is reported as having determined to take steps to compel the East Jersey Water company to deliver the contract number of gallons of water per day. The quantity of water delivered on the first three days of February was 1,000,000 gallons less than called for.

Brooklyn, N. Y.—The reports of the health department show that Ridgewood water is, in many respects, purer and more wholesome than that which the residents of Manhattan the Bronx procure from the Croton water shed, and that the Brooklyn death rate is nearly two points lower than Manhattan's and over three less than that of Bronx.

Los Angeles, Cal.—The water supply committee of the council reported about Feb. 1 that steps have been taken toward municipal ownership of a system of water works. A resolution was passed Feb. 7 calling upon

the City Water company to furnish an inventory of its plant in order to be able, when the proper time arrives, to agree upon the value of the property.

Washington, D. C.—Capt. D. D. Gaillard, U. S. A. engineer in charge of the Washington Aqueduct, and Surgeon-General Geo. M. Sternberg, U. S. A., recommends the filtration of the water supply. Capt. Gaillard estimates the cost of constructing a slow sand filtration plant at $810,000, and the relative annual charge for operation and capital account would be, according to his estimates, $141,912 for slow sand and $140,379 for mechanical filtration. The employment of an expert commission to report on the most suitable method for purifying the supply is recommended.

Philadelphia, Pa.—Representatives of the County Medical Society of Philadelphia, the College of Physicians and Surgeons, the Municipal League and the City Organizations' Filtration Committee, met with the Council's Committee on Water Feb. 10 to discuss the betterment of the water supply. The medical experts agreed that the Schuylkill river is alone responsible for the epidemic of typhoid fever which has existed, and that filtration is the only logical scheme for relief.

New York City.—The Citizens' Water Co., of Long Island City, offered Feb. 16 to make a contract with this city, by which it would agree to furnish that part of the borough of Queens known as Long Island City, with pure and wholesome water to the amount of 500,000 gals. a day, within thirty days, and to the commissioner of water supply would be given the option of increasing this to 30,000,000 gals. daily. The right to lay mains is to be granted, and the question of additional supply and extension of the company's system is left to the commissioner. The company asked $65 for each million gallons furnished. Action on the proposition was postponed for a week. A resolution to expend $77,200 to lay water mains in Long Island City was passed.

CONTEMPLATED WORK.

Cromwell, Conn.—Plans and surveys for a water works system are being made.

Atlanta, Ga.—The question of issuing $200,000 water bonds will be voted on in April.

Grinnell, Ia.—The construction of a reservoir at the pumping station is contemplated.

Fargo, N. D.—This city has decided to purchase another large water works pump.

Oshkosh, Wis.—The question of purchasing the water works will be voted on April 12.

Lumpkin, Ga.—A committee has been appointed to secure plans and specifications for water works. W. L. Mardre, clk.

California, Mo.—Estimates for a water works system for this place will be furnished by Hiram Phillips, C. E., of St. Louis.

Tucson, Ariz.—Several propositions are being entertained by the city council for water works. Geo. Helen, cy. engr.

Sycamore, O.—Plans and specifications for the proposed water works plant are being made by G. L. McKibben of Van Wert, O.

Moline, Ill.—Mayor Swensson called a recent meeting to consider and agree upon some plan for providing a pure water supply.

Swampscott, Mass.—A report was adopted at a town meeting Feb. 14 to not purchase the plant of the Marblehead Water Co. unless more favorable terms were offered than have been.

McComb, Ill.—A lift pump and a force pump will be required for sinking the proposed artesian well this spring. W. E. Thompson, supt.

Bainbridge, O.—Wm. G. Moler has been appointed consulting engineer for the proposed water works and electric light plant.

Lansingburgh, N. Y.—A bill has been introduced in the legislature to permit this village to bond for $60,000 for securing a water supply.

Ft. Wayne, Ind.—The water works trustees are preparing to receive bids for the erection of the proposed new pumping station.

St. Charles, Ill.—The question of constructing water works is being discussed and the mayor has been directed to obtain prices on a pump.

Trenton, Mich.—The water commissioners contemplate putting in another pumping engine of 1,000,000 gals.' capacity. O. P. Benoit, comr.

Ft. Scott, Kas.—The question of issuing $150,000 in bonds for municipal water works and an electric light plant will probably be voted on.

The question of constructing water works is being agitated at the following places: Hanford, Cal.; Thornton, Ind.; Flagstaff, Ariz.; Morris, Minn.

Fulton, Ark.—The mayor is reported as desiring to correspond with manufacturers of supplies, wind mills and the builders of small water works plants.

Memphis, Tenn.—An election will be held to determine whether or not the city should purchase the plant of the Artesian Water company. J. J. Williams, mayor.

Philadelphia, Pa.—An ordinance is in the council asking for an appropriation for repairs to the pumping station at Belmont, Queen Lane and Roxborough.

Rockville, Ind.—The city council contemplates engaging J. A. Cole of Chicago to make plans and specifications for the proposed water works system.

Salt Lake City, Utah.—The construction of a tunnel in Emigration Canyon has been recommended for the purpose of increasing the water supply from that source.

Buffalo, N. Y.—The construction of a filtering plant for the purification of the water supply will be recommended by the board of health, according to press reports.

Chester, Pa.—A resolution was introduced in the common council, Feb. 7, asking that active steps be taken to compel the New Chester Water company to install a filtration plant.

Ogdensburg, N. Y.—The purchase of a 4,000,000 gallon pump is contemplated, and abut 2 miles of 6 to 14-inch cast-iron pipe may be laid. H. A. Lord, supt. city w. w.

Bloomville, O.—Plans and specifications for a water works system are being prepared and the question will be submitted to a vote as soon as they are completed. A. S. Prouse, town clk.

Aberdeen, Miss.—The bill authorizing the mayor and board of aldermen to issue bonds for constructing water works, sewerage and electric light plant has been signed by the governor.

Williamsport, Md.—A bill has been sent to the legislature to empower this town to issue $20,000 in bonds for erecting an electric light and water works plant. The matter will

be voted on in March, if the bill is acted on in time.

Tampa, Fla.—The purchase of an additional boiler and large pump is contemplated for the water works, according to report. A system of water works is also contemplated for West Tampa.

Rochester, N. Y.—Chief Engineer Kuichling's estimate of the amount of the appropriation needed this year for water pipe extension, the extension of the large distributing mains, etc., is $85,000.

Los Angeles, Cal.—Negotiations will be opened with the West Side Water Co. with reference to a possible purchase of that portion of the plant which is used in furnishing water to inhabitants of this city.

Topeka, Kas.—The city council decided Feb. 9 to cease all further efforts toward making an agreement with the water company upon rates and to vote in the spring on a proposition to build its own plant.

Mena, Ark.—The erection of a standpipe 50 feet high by 15 feet in diameter, and laying 4 to 6-inch water mains is contemplated. Information regarding the proposed improvement is desired. W. W. Whitely, cy. clk.

Columbus, O.—The plans for the proposed concrete dam have been approved by the board of public works. The Columbus Water Co. has filed articles of incorporation for supplying and selling water to cities, towns, villages, townships, etc.

The question of issuing bonds for constructing water works has been favorbaly voted on as follows: Concordia, Mo.; Winchester, Ind.; Crystal Springs, Miss.; Boyertown, Pa.; Farmersville, Tex.; Bedford, Pa.; Parnassus, Pa.; Andover, Mass.

The question of issuing bonds for the construction of water works will be voted on as follows: Columbus, Tenn.; Sterling, Col., in April; Lamoni, Ia., March 28; Pocomoke City, Md., in March; Hyattsville, Md., in May; Fitzgerald, Ga., March 8; McComb, Miss.

Canandaigua, N. Y.—A board of trustee committee has been appointed to confer with the water commissioner regarding the most feasible plan for increasing the capacity of the local water works plant. The purchase of additional machinery for the lake shore pumping station has been proposed.

The construction of water works systems is contemplated at the following places: Jackson, O.; Abingdon, Ill.; Oberlin, O.; Eldorado, Col.; Paris, Tex.; Boonsboro, Md.; Auburn, Cal.; Swainsboro, N. C.; Goldsboro, N. C.; Westfield, N. J.; Auburn, Ind.; Beaumont, Tex.; Davenport, Wash.; Enfield, Mass.

Petersburg, Va.—An amendment to the city charter was adopted by the common council Feb. 10 to present to legislature, empowering this city to establish and enlarge water works, gas works and electric plants, and to condemn property along the canal and upper Appomattox river, to obtain a water supply and to protect it from pollution.

Louisville, Ky.—The plans and specifications for the filtration system will be ready for inviting proposals early in the spring. The plan is to utilize the two big basins, now used as reservoirs, as subsiding basins, where the water will be allowed to settle sufficiently to relieve it of mud and other impurities. These basins are high encugh to allow the water to pass mechanically into the sand filters, which will be above the clear water basin; from the sand filters the water will drain into the clear water basin, and then pumped into an immense standpipe; there will be from 80 to 100 sand filters, each from 18 to 20 ft. in diameter, and from 2½ to 3 ft. of sand in the bottom of each to catch the impurities before the water reaches the clear water reservoir, which will have a capacity of 25,000,000 gals.; the water will also be treated chemically as it passes into the subsiding basins or as it passes from them into the filters. The entire cost of the improvements is placed at about $300,000.

CONTRACTS TO BE LET.

Cincinnati, O.—Press reports state that bids will be asked by April 1 for building the Turkey Bottoms conduit and the intake pier.

Holly Springs, Miss.—Sealed proposals will be received until March 28 for constructing a water plant. Sam Finley, mayor.

St. John, N. B.—Tenders will be received until April 12 for supplying about 3,116 tons of cast iron water pipe. A. Chipman Smith.

Kingston, N. Y.—Bids will probably be asked about April 1 for improving the reservoir, well house, etc. O. C. Longyear, supt. w. w.

Port Jefferson, (L. I.), N. Y.—Bids will be received about March 1 for a water works system. Wm. Wheeler, Secy. Port Jefferson Water company.

Cleveland, O.—Sealed proposals will be received until March 3 for furnishing gates, valves and stock-cock boxes for the year 1898. Geo. R. Warden, dir. pub. wks.

Chicago, Ill.—Sealed proposals will be received until March 4 for laying water service pipes in Avenue L, Harvard-st. and Ridgeway-ave. L. E. McCann, comr. pub. wks.

Oregon, Mo.—Sealed proposels will be received until March 7 for constructing a system of water works. Hiram Phillips, St. Louis, Mo., cons. engr.; H. T. Alkire, mayor.

Portland, Ore.—Sealed proposals will be received until March 15 for furnishing and laying a submerged pipe of steel, 24-in. in diameter and 2,100 ft. in length, across the Willimantic river. Frank T. Dodge, clk. water com.

Wilkesbarre, Pa.—Sealed proposals will be received until March 4 for the construction of an embankment dam with a masonry core wall on Gardner's creek, in Plains twp., Luzerne co., Spring Brook Water Supply company.

St. Joseph, Mo.—The committee wishes to correspond with responsible parties with a view to entering promptly into negotiations for supplying the city of St. Joseph with water for a period of years from and after Dec. 10, 1899; supply is to be for fire protection and domestic and manufacturing purposes; works must be of gravity system; 56 miles of mains must be laid within the city limits and 500 fire hydrants placed ready for use by the date mentioned; all proposals should be addressed "To the Com. on Water supply, care Cy. Engr." Chas. Campbell, cy. engr.

CONTRACTS AWARDED.

Greensburg, Pa.—Robert Duncan and William Duquid have been awarded the contract for constructing a storage reservoir.

Elberton, Ga.—The contract for constructing a system of water works has been awarded to G. J. Baldwin of Savannah.

Worthington, Ind.—The contract for constructing a water works and electric light plant has been awarded to T. B. Sherman of Chicago.

Elmwood Place, O.—Ritter & Tosso of this place secured the contract, Feb., 2, for laying pipe, setting hydrants and valves, etc.

Los Angeles, Cal.—Herman de Laguna has made a proposition to the city council to construct and equip a complete water plant for $1,875,000. The offer has been filed.

Springfield, Ill.—The city council decided, Feb. 12, to purchase a Worthington pump for the water works. The pump is a type B engine with a capacity of 5,560 gallons per minute, and cost $25,000.

Lockport, N. Y.—The contract for furnishing this city with 15,000,000 gallons of water daily was awarded, Feb. 14, to the Lockport & Ontario Power company, which is composed of local business men, for $50,000 yearly for the first ten years.

Lancaster, O.—The contract for improving the water works has been awarded as follows: Pipe and special castings, digging trenches, laying pipe, etc., Adams Bros., Zanesville, $8,209.62; reservoir complete, Henry Karg, Fostoria, $9,799.

Albany, N. Y.—T. Henry Dumary was the lowest bidder for contract No. 3, for the filtration plant, and the contract will probably be awarded to him. The bids received were as follows: T. Henry Dumary and Wilson & Baillie, $309,866.47; J. W. Kinser & Son of Leominster, Mass., $322,358; Warren-Scharf Asphalt Paving company of New York, $325,982.54; Jonathan Clarke, Sons & Co. of Chicago, $330,982; Long & Little of Waltham, Mass., $334,222.70; M. J. Dady of Brooklyn, $335,767; McGuire & Hall of New York, $337,761.16; Prescott, Buckley & Callahan of Keesville, $348,443; P. J. Carlin & Co. of New York, $384,766; McDonnough & Cunningham of Troy, $387,345.

BRIDGES.

Dakotah, Ia.—Bids are asked until April 5 for constructing county bridges during 1898.

Albion, Idaho.—A bridge will be constructed across Snake river. Frank Riblett, engr.

Wapello, Ia.—A county bridge will be constructed across Cedar river this spring.

Ozark, Ala.—The Dale county commissioners have been authorized to build two bridges across the Choctawachee river.

Denver, Col.—Contracts will probably be let by April 15 for constructing the Fourteenth-st. viaduct.

Boston, Mass.—City Engineer Jackson has prepared plans for the proposed bridge between this city and Cambridge.

Anoka, Minn.—The question of issuing bonds for building a free bridge across the Rum river will be voted on March 8.

Beatrice, Neb.—Bids are asked until March 2 for constructing bridges in Gage county. J. M. Jones, chrmn. co. bd.

Natchitoches, La.—The police jury has appropriated $100,000 toward the construction of a bridge over Red river.

Sunnyside, Wash.—The question of building a bridge across the river at Nabton is being agitated. Jas. Henderson, cy. clk.

Hornellsville, N. Y.—The taxpayers will vote on appropriating $2,400 for the erection of a bridge over the creek at Van Scoter-st.

Marquette, Mich.—The Portage township board has voted to build a steel bridge across the Pilgrim river at a cost of about $1,300.

Spring Valley, Ill.—A wagon bridge, which cost this city $30,000, fell into the Illinois river recently. Mayor Nelson.

Mt. Vernon, N. Y.—A bridge will be built across the Hutchinson river at Fulton-ave. by the board of highway commissioners.

Nebraska City, Neb.—Bids are asked until March 4 for constructing county bridges during 1898. H. R. Christy, co. audt.

Chillicothe, O.—The Ross county board has been petitioned to replace the wooden structure in Deerfield township with a modern bridge.

Renssalaer, N. Y.—The question of constructing a bridge at Third-ave. across the railroad tracks is being considered by the common council.

La Moure, N. D.—The contract for the proposed bridges over Cottonwood and Maple Creek will probably be let in April. Chas. Alister, co. audt.

Kalama, Wash.—Bids are asked until April 7 for constructing a 150-ft. span bridge across the Kalama river. W. S. Lyons, clk. bd. co. supervisors.

Clinton, Ind.—The proposition to appropriate $1,200 to aid in the construction of a free bridge across the river was favorably voted on Feb. 3.

Denver, Col.—A resolution has been passed by the city council authorizing the board of public works to construct a bridge across Cherry creek at W. Eighth and S. Fourteenth-sts.

Milo, N. Y.—The highway commissioners have decided to take some action toward making the necessary repairs to the Liberty-st. bridge in Penn Yan, which needs new planks and steel girders.

New Albany, Ind.—Plans and specifications have been ordered prepared by the city council for building a bridge at Seventh-st., north of Spring-st., at a cost not to exceed $5,000.

PARKS.

Kansas City, Mo.—The board of park commissioners has decided that Broadway is the most suitable street for a connecting link between West Terrace and Penn Valley parks.

Des Moines, Ia.—The Senate has passed a bill reducing from 40,000 to 25,000 population the size of cities which may levy taxes for city parks and appoint park commissioners.

Middletown, Conn.—A competent landscape architect will be employed to make satisfactory plans for proposed improvements at Union park. Clarence E. Bacon, chrmn. com. on pub. improvements.

Washington, D. C.—A bill has been introduced by Mr. Catchings providing for an additional park to this city and for the purchase of land known as Wilson Park, Congress Heights, containing 100 acres of land, to be used as a public park. The bill provides for an appropriation for the purchase of $350,000.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Evansville, Ind.—Resolutions have been passed for sprinkling the streets of this city. George W. Swearingen, clk. B. P. W.

Mt. Vernon, N. Y.—The contract for removing the garbage and ashes for two years has been awarded to Henry Fink at $6,000 a year.

Bayonne, N. J.—The question of removing the garbage of this city is being considered by the board of health. Henry T. Meigs, vice-prest.

Tucson, Ariz.—Sealed proposals will be received until March 7 for sweeping and cleaning the streets, removing garbage, etc. Charles T. Connell, recorder.

Buffalo, N. Y.—The aldermanic committee has recommended that bids be received for the removal and disposal of garbage. The present contract expires in June.

Minneapolis, Minn.—The contract for the collection and disposal of garbage has been awarded to C. T. Frane for $17,500 for the first year and $17,000 for the second year.

St. Louis, Mo.—Sealed proposals will be received until March 4, for sprinkling 29.87 miles of streets, from March 15 to Dec. 1, 1898. Robert E. McMath, prest. B. P. W. I.

Indianapolis, Ind.—The board of public works adopted sprinkling specifications for 1898, Feb. 9, which provided for twenty-three districts. The date for receiving bids was not determined upon.

Columbus, O.—A bill will be introduced in the legislature which provides that "in no case shall one side of any street or avenue be sprinkled until the other side is dry," and other sections provide for cleaning and care of streets and planting of shade trees.

Chicago, Ill.—The commissioner of public works, L. E. McGann, has recently published a notice requiring that ashes and garbage be kept in separate metal vessels, provided with close fitting covers and suitable handles.

Saginaw, Mich.—The council committee has taken under consideration the question of keeping the new asphalt pavement clean. The city clerk has been corresponding with a number of cities regarding the method of providing money for this purpose.

Dayton, O.—(Special.)—The contract for removing garbage for one year from the entire city has been awarded to Robt. J. Paul for $3,960, and for removing asnes and rubbish in District Nos. 1 and 4 for $1,200. District No. 2 was awarded to Martz Bros. for $1,960 and District No. 3 to Pat Dwyer for $840.

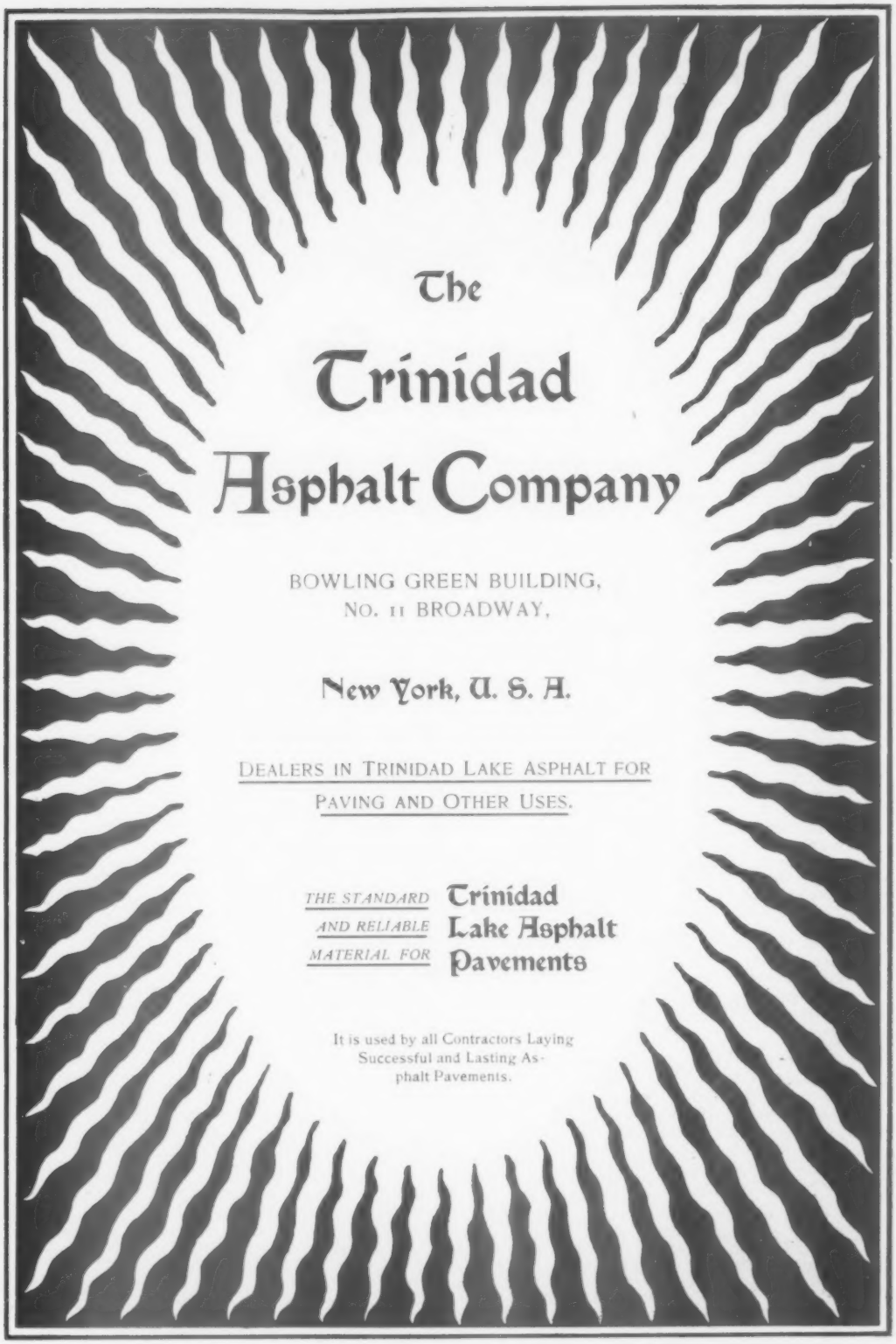
Washington, D. C.—An amendment to the district appropriation reads as follows: "The commissioners of the District of Columbia are authorized at the expiration of the pending contracts for sprinkling, sweeping and cleaning streets, avenues, alleys and suburban streets in the District of Columbia to have all said work done by labor, under direction of said commissioners, without contract."

Des Moines, Ia.—The Indianapolis Street Cleaning company, Indianapolis, Ind., has made a proposition to clean the streets of this city with the pneumatic street cleaning machine, as follows: Each five miles of street swept, $14; gutter machines, per night, $1; one team and wagon to haul dirt, $3; three horses and driver for pneumatic machine, $3; coal oil and water for machine, $1; man to work with shovel and broom, $1.25; total, $23.55. The company furnishes the operator for the machine. The company is willing to sell the machine to the city or will clean it for the season.

Minneapolis, Minn.—Plans have been drawn by Jacob Jacobi for a garbage crematory which will consume 100 tons of garbage in sixteen hours at a cost of $20. The plans arrange for the gradual dumping of garbage into the furnace, where it is consumed; the openings to the furnace are arrangements like pockets, at the sides, instead of an opening on top, through which much heat is lost; the garbage is heated to a great extent in these pockets before being dropped upon the flames, and the arrangement is such that little heat is allowed to escape; the liquids flowing from the retorts are treated with disinfectant before being allowed to escape.

Lafayette, Ind.—Bids were received, Feb. 14, for constructing a garbage crematory building and waste heat boiler as follows: Pennsylvania Construction company, Marietta, Pa.; No. 1—$11,225; 2—$10,500; 3—$8,750. American Sanitary Engineering company, Toledo, O., No. 1—$13,300; 2—$14,800; 3—$12,200. The Engle Sanitary and Cremation company., Des Moines, Iowa, $9,500; W. J. Willis, Findlay, O., $8,985.

Boston, Mass.—A suit has been brought to annul the garbage disposal contract, which was recently awarded to the New England Sanitary Reduction company. The suit is brought by the Merz Universal Extractor & Construction company of New York City, which alleges that the location of the reduction works was changed from Spectacle Island to the Calf Pasture after the invitation for bids was issued; that the company to whom the contract was awarded knew of the change, but the plaintiff did not; that had the plaintiff known of the change in location it would have bid $45,000 a year, or less, instead of $55,000. The contract was awarded to the New England Reduction company at $47,000 a year.



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